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PUBLICATIONS OF THE
BRITISH FIRE PREVENTION COMMITTEE.—No. 80.

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FIRE TESTS WITH DOORS

AN IRON FRAMED DOOR,
WITH STYLES AND RAILS BOTH SIDES.

AN IRON FRAMED DOOR,
WITH STYLES AND RAILS ONE SIDE.

Particulars
OF
EXPERIMENTAL FIRE TESTS.

LONDON, 1901.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(Parent Office—Incorporated 1891.)
1 WATERLOO PLACE, PALL MALL.

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BRITISH FIRE PREVENTION COMMITTEE.—No. 60.

Edited by Edwin O. Sachs.

FIRE TESTS WITH DOORS

AN IRON FRAMED DOOR, WITH STYLES AND RAILS BOTH SIDES

AN IRON FRAMED DOOR, WITH STYLES AND RAILS ONE SIDE

Particulars

OF

EXPERIMENTAL FIRE TESTS

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LONDON, 1901

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OBJECTS OF THE COMMITTEE:

The main objects of the Committee are:—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

NOTE.

THE report presented herewith deals with two iron doors constructed according to two different specifications, frequently described as the "Building Act" and the "Insurance" specifications respectively.

Further tests with iron doors will be undertaken in due course, so that a series of data may be available as in the case of the tests with wood doors.

EDWIN O. SACHS.

LONDON,
March, 1901.

THE GENERAL ARRANGEMENTS FOR TESTS.

(MEMORANDUM.)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Committee's present Testing Station, it comprises an old mansion, standing in its own grounds, near Westbourne Park, and close to Royal Oak Station. The house is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. Any surplus is refunded. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

For the Executive,

EDWIN O. SACHS, *Chairman.*

EXPERIMENTAL FIRE TESTS

CONDUCTED BY THE EXECUTIVE

OF THE

BRITISH FIRE PREVENTION COMMITTEE.

[FOUNDED 1897—INCORPORATED 1899.]

FIRE TESTS, Ka and La. JULY 25TH, 1900.

(Ka) An Iron Framed Door, with Styles and Rails both Sides.

(La) An Iron Framed Door, with Styles and Rails one Side.

OBJECT OF TEST.

To record the effect of a fierce fire of one hour, gradually increasing to a temperature of 2000° Fahr., followed suddenly by the application of water for five minutes and consequent rapid cooling.

Note.—The door-openings were to be approximately 3 ft. 3 in. by 6 ft. 9 in.

Note.—The fire was to be applied from one side, and the doors were to open inwards on to the fire side.

SUMMARY OF EFFECT.

Door with Styles and Rails on Both Sides, Secured at Six Points.

In 8 minutes the door had bulged inwards $\frac{3}{8}$ in. above and below the centre fastenings.

In 59 minutes the door was red-hot almost all over, and the bulging had increased to about 1 in.

Door with Styles and Rails on One Side, Secured at Five Points.

In 5 minutes the door had bulged inwards $\frac{3}{4}$ in. on western side.

In 11 minutes the bulge mentioned above had increased to 2 in.

In 18 minutes the bulge had increased to $2\frac{1}{2}$ in.

In 59 minutes the door was red-hot almost all over, and the top eastern corner had bent inwards $\frac{3}{4}$ in., the bolt having dropped.

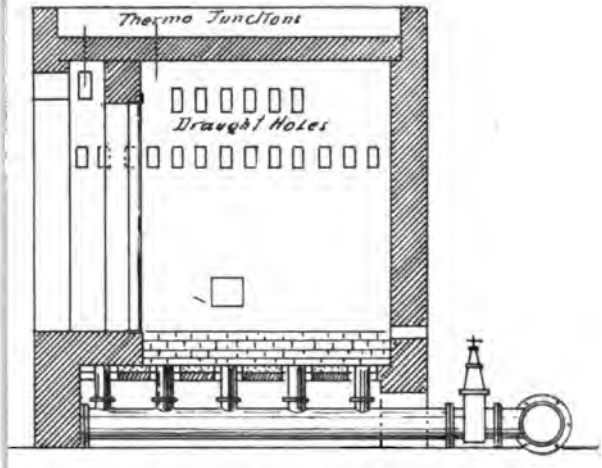
DESCRIPTION OF TESTING PLANT.

(*See Figs.* A, B, C *and* D.)

The Testing Chamber used was located at the Committee's Testing Station, and was known as No. 6 Hut.

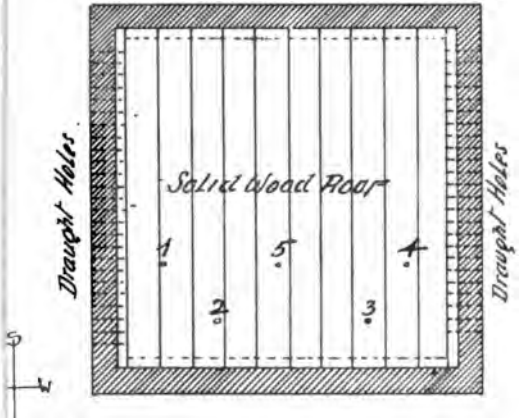
The chamber was constructed, as shown, of stock bricks with lime mortar, and measured 10 ft. by 10 ft. internally.

The ceiling of the hut was 9 ft. 6 in. above the pavement of the chamber, and was formed of solid wood beams grouted with fire-clay.

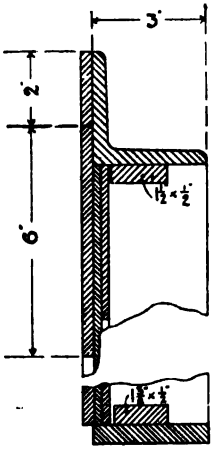


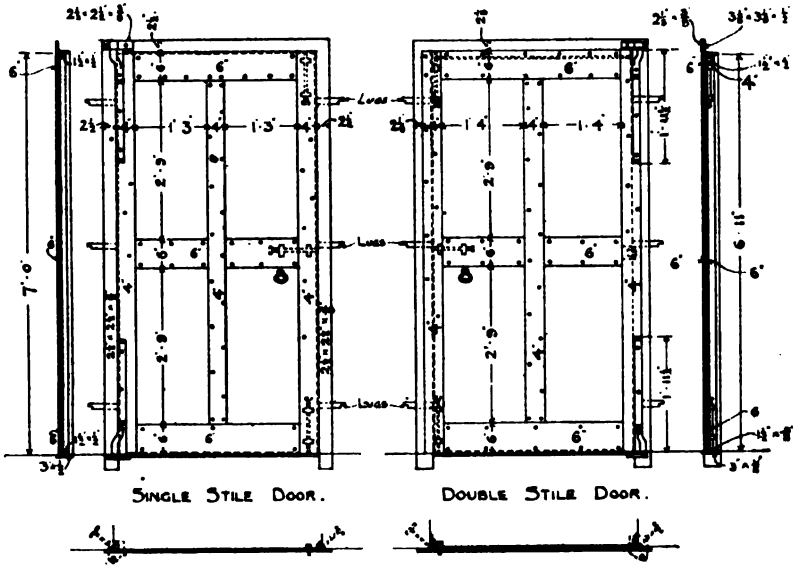
SECTION LOOKING EAST

Note. The Points marked 1·2·3·4·5. are Thermo Junctions attached to Wires Leading to Pyrometers. N° 5 is self recording.

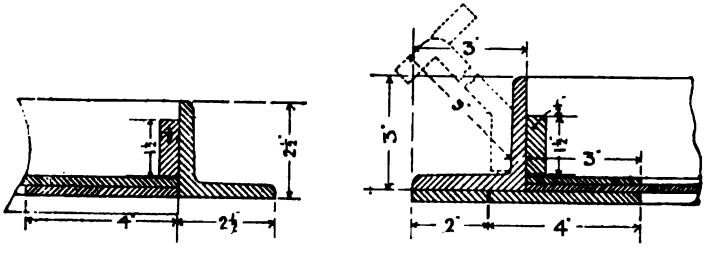


PLAN OF ROOF





Plan of Iron Doors.



Figs. E, F. The Doors, Details.

The fuel used was gas produced at the Station, and the supply was regulated by valves and dampers.

The gas was admitted through two mixing chambers of fire-brick.

Two Roberts-Austen pyrometers were used for recording temperatures, to take four observation records from points Nos. 1, 2, 3 and 4, and one automatic record from point

Fig. 6. THE DOORS—VIEW PRIOR TO TEST.

No. 5. Points Nos. 2 and 3 were outside the doors, and the others on the fire side of the doors.

There were observation holes in the east and west walls, closed by movable iron shutters.

The draught holes were in the east and west walls.

The photographs were taken, some by daylight and some by flash-light.

The stream of water was applied through a branch with

a ½-in. nozzle, supplied from a manual fire engine fitted with a pressure gauge.

A brick wall 14 in. thick, with two openings 3 ft. 4 in. wide, 7 ft. 0 in. high, was built across the hut, running from east to west. It was built 13 in. back from the main wall. The wall was carried up to the ceiling, the height between the floor and the ceiling being 9 ft. 6 in. The two openings were arched over with brick arches in two half-brick rings. The wall was built with gauged stuff.

CONSTRUCTION OF THE DOORS.

(*See Figs.* E *to* F.)

Door with Styles and Rails on Both Sides, Secured at Six Points.

The door was described as being of steel, of the thickness commercially known as ¼ in., the size shown on the detail, viz. 3 ft. 8 in. wide by 7 ft. high; on the inside, styles and rails ⅜ in. thick were fixed, the styles 4 in. wide and the rails 6 in. wide; on the outside, styles and rails ¼ in. were fixed; the outer styles were 3 in. wide and the centre one 4 in. wide; the bottom and middle rails were 6 in. wide and the top one 4 in. wide; the whole being riveted together with ⅜-in. rivets about 6 in. pitch, the rivets going through all the plates. The outer styles and top rail on the inside of the door lapped over the frame 1 in. The top and sides of the frame were angles 3 in. by 3 in., ½ in. thick, with 1½-in. by ½-in. bar riveted on to form stop, the rivets being about 14 in. pitch. The bottom of the frame was 3-in. by ½-in. plate with 1⅜-in. by ½-in. bar screwed on to form stop, the screws having the heads countersunk, 3 in all.

At the top and sides, on the inside face of the angle frame, a 2-in. by ⅜-in. bar was riveted on to form a face flush with the inside face of the styles.

The hinges were formed of plates screwed on to the inside styles of the door formed into pivots at the top and bottom, the latter going into holes in a plate riveted on to the bottom of the frame which formed the hinge; at the top the pivot was enclosed with a socket riveted on, which formed the top hinge.

The three bolts, at the top and bottom shooting vertically and in the centre shooting horizontally, into holes in

the frame, were of $\frac{7}{8}$-in. by $\frac{5}{8}$-in., with two small enclosing straps round each ; the bolt at the top had a spring at the back to keep it up in position ; on the back of each bolt a pin and knob were riveted, going through the door, so that the bolts could be shot from the inside of the door as well as the outside.

On the outside of the door on the hinge-style a stud $\frac{7}{8}$ in. by $\frac{1}{2}$ in., on a plate, was riveted ; this stud, which projected beyond the edge of the door, went into a hole in the frame, forming a third point at which the door was held in position by the frame on the hinge side.

Three lugs were riveted on to each side of the frame. These lugs were built into the brickwork, and formed the fixing of the door-frame, which was built into the opening on the west side of the hut.

Door with Styles and Rails on One Side, Secured at Five Points.

The door was described as being of steel, of the thickness commercially known as $\frac{1}{4}$ in., the size shown on the detail, viz. 3 ft. 6 in. wide by 7 ft. high ; on the inside were riveted styles and rails all $\frac{1}{4}$ in. thick ; the top, middle and bottom rails were 6 in. wide, and the side and centre styles 4 in. wide ; the whole being riveted together with $\frac{1}{2}$-in. rivets, about 6 in. pitch.

The top and sides of the frame were angles $2\frac{1}{2}$ in. by $2\frac{1}{2}$ in., $\frac{3}{8}$ in. thick, all with $1\frac{1}{2}$ in. by $\frac{1}{2}$ in. bar riveted on to form stop, and the same to the bottom bar, which was 3 in. by $\frac{1}{2}$ in.

The hinges, bolts, lugs and fixing were the same as those to the door with styles and rails on both sides, but there was no stud on the centre of the hanging style, so the door was only fastened at five points.

PREPARATIONS FOR THE TEST.

On July 25th a photograph was taken of the doors in position from the outside. (See Fig. G.)

THE TEST.

(*See Figs.* H, I & J.)

On July 25th, 1900, the test was undertaken.

The following is the log of the test :—

At 3 p.m the meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows :—

State of weather, clouds; Rain, none; Wind, S.W.; Barometer, 29·90 in.; Attached Thermometer, 83° Fahr.; Dry bulb, 90° Fahr.; Wet bulb, 73° Fahr.; Remarks, Very hot afternoon.

The following temperature observations were taken during the test from points Nos. 1, 2, 3 and 4 :—

—	Inside.		Outside.	
Time.	No. 1. Fahr.	No. 4. Fahr.	No. 2. Fahr.	No. 3. Fahr.
3.20 p.m.	500°	500°	—	—
3.25 „	1100°	1100°	—	—
3.30 „	1350°	1280°	—	150°
3.35 „	1540°	1480°	100°	250°
3.40 „	1480°	1480°	175°	300°
3.45 „	1500°	1520°	180°	350°
3.50 „	1400°	1600°	220°	350°
3.55 „	1300°	1650°	250°	400°
4.0 „	1600°	1720°	300°	410°
4.5 „	1600°	1700°	300°	460°
4.10 „	1520°	1800°	310°	480°
4.15 „	1450°	(broken)	360°	500°

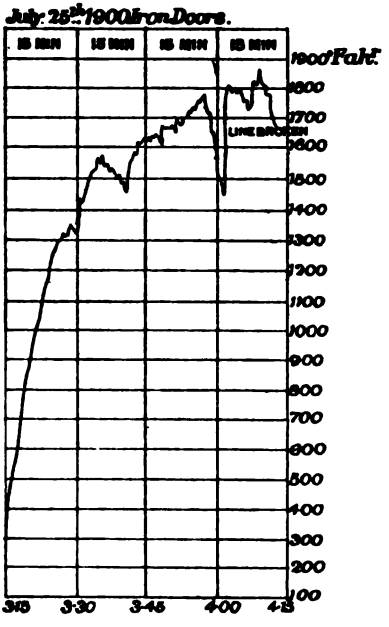
Figs. H. THE DOORS—VIEWS DURING AND AFTER TEST.

Fig. 1.

VIEW OF DOOR WITH STYLES AND RAILS BOTH SIDES, AFTER TEST (FROM INSIDE).

Fig. J.
VIEW OF DOOR WITH STYLES AND RAILS ONE SIDE, AFTER TEST (FROM INSIDE).

Automatic Record at Point No. 5.



Door with Styles and Rails Both Sides, Secured at Six Points.

At 3.16 p.m. the gas was lighted.

Door with Styles and Rails One Side Only, Secured at Five Points.

At 3.16 p.m. the gas was lighted.

At 3.21 p.m. the door had bulged inwards $\frac{3}{4}$ in. on the west or hinge side, the greatest extent of curve being slightly below the centre of height.

DOOR SECURED AT SIX POINTS —*continued.*

At 3.24 p.m. the door was bulged inwards $\frac{3}{8}$ in. both above and below the centre stud and bolt, the greatest extent of the curve in each case being about one quarter of the height from top to bottom.

At 4.15 p.m. the door was red hot almost all over, the bulging above mentioned having increased to 1 in. on the east side above the centre fastening, and $\frac{7}{8}$ in. on the west side at the same level.

At 4.16 p.m. the gas was turned off.

At 4.17 p.m. water was applied alternately on the two doors for three minutes, and the test was closed.

(*See Fig.* 1.)

DOOR SECURED AT FIVE POINTS —*continued.*

At 3.27 p.m. the bulge on the west side mentioned above had increased to 2 in. and on the east side it was bulged inwards $\frac{1}{4}$ in., both above and below the centre fastening.

At 3.34 p.m. the bulge on the west side had increased to $2\frac{1}{2}$ in.

At 4.15 p.m. the door was red hot almost all over, the top east corner bending inwards, leaving a space of $\frac{3}{4}$ in. between door and frame, the bolt being red hot and having dropped.

At 4.16 p.m. the gas was turned off.

At 4.17 p.m. water was applied alternately on the two doors for three minutes, and the test was closed.

(*See Fig.* 1.)

208528

GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive comprising—

Mr. Max Clarke, A.R.I.B.A. (Directing Member).
Mr. Ellis Marsland, District Surveyor, Camberwell.
Mr. T. E. Gatehouse, F.R.S.Ed.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended in the Instrument Room.

The Council was represented by—

Mr. Arthur Cates, F.R.I.B.A., F.S.I., late Surveyor, Crown Estates.
Major-General Festing, South Kensington Museum.

The Executive was represented by—

Mr. Edwin O. Sachs (Chairman).
Mr. Hammond, F.R.I.B.A.

The general body of Members was represented by—

Mr. William Abbot, F.S.I.
Mr. T. Lewis Banks, F.R.I.B.A.
Mr. F. Sizer Capon (Architect's Department, L.C.C.)
Mr. Bernard Dicksee, A.R.I.B.A., District Surveyor, East Newington.
Mr. Augustus Frere, F.R.I.B.A.
Mr. F. W. Hamilton, A.R.I.B.A., District Surveyor, North Fulham.
Mr. E. R. Hewitt, A.R.I.B.A., District Surveyor, St. Saviour's, Southwark.
Mr. W. Hewson Lees, A.R.I.B.A., District Surveyor, South-East Deptford.
Mr. N. B. McDermott, F.S.I. (late of War Office).

Mr. R. P. Notley, F.R.I.B.A., District Surveyor, Bethnal Green.
Mr. L. Pyke, A.M.Inst.C.E.
Mr. H. H. Ray.
Mr. Jas. Sheppard.
Mr. Sydney R. J. Smith.
Mr. W. Waine.
Mr. F. Wallen, District Surveyor, West St Pancras.
Mr. T. Wilkins, F.G.S.
Mr. Oswald C. Wylson, F.R.I.B.A.

The Crittall Manufacturing Co. was represented by—

Mr. E. H. Runnacles.

The following visitors attended by special invitation of the Executive:—

Mr. C. C. Absolom; Mr. L. Azario; Mr. Paul Blaschke; Mr. Clarence Coggin; Mr. Roy Collier; Mr. W. B. Downs; Mr. Albert Gray; Mr. J. Halford; Mr. J. Heyne; Mr. Septimus Marsland; Mr. E. Robins; Mr. R. Robertson; Mr. W. F. Sherman; Mr. A. W. Smith; and Mr. F. G. Minter.

Signed,

For the Sub-Committee conducting the Test:
MAX CLARKE (*Directing Member*).

For the Commercial Section:
FREDERIC R. FARROW.

For the Executive:
EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.

H. S. TAYLOR
(*Asst. Secretary*).

Date—March 1901.

LONDON:
PRINTED BY WILLIAM CLOWES AND SONS, LTD., STAMFORD STREET
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PUBLICATIONS OF THE
BRITISH FIRE PREVENTION COMMITTEE.—No. 61.
Edited by Edwin O. Sachs.

FIRE TESTS WITH FLOORS

A FLOOR
OF
STEEL JOISTS WITH COKE BREEZE CONCRETE

Particulars
OF
EXPERIMENTAL FIRE TEST

LONDON, 1901.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(Founded 1897—Incorporated 1899)
7 WATERLOO PLACE, PALL MALL.

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21. FIRE TESTS WITH FLOORS. A Floor of Steel Joists, filled in with Concrete on Corrugated Iron, with a Suspended Ceiling.
22. FIRE TESTS WITH PARTITIONS. A Lath and Plaster Partition; a Bricked Nogged Partition.
23. FIRE TESTS WITH FLOORS. A Floor by the Columbian Fireproofing Co., New York.
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25. FIRE TESTS WITH DOORS. A Wood Door covered with Tinned Steel Plates; an Iron Framed and Panelled Door.
26. FIRE TESTS WITH DOORS A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
28. FIRE TESTS WITH CEILINGS. A Ceiling of Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
29. FIRE TESTS WITH GLASS. Three Casements glazed by the British Luxfer Prism Syndicate, Ltd.
30. FIRE TESTS WITH GLASS. Five Skylights glazed by the British Luxfer Prism Syndicate, Ltd.
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OBJECTS OF THE COMMITTEE:

The main objects of the Committee are:—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

NOTE.

THIS Report deals with a floor of concrete and iron, the lower flange of the iron work being protected.

Floors of similar construction are frequently used by the London County Council in their work.

This report should be considered in conjunction with an earlier report dealing with a similar floor where the lower flange is not protected.

EDWIN O. SACHS.

LONDON,
October 30th, 1901.

THE GENERAL ARRANGEMENTS FOR TESTS.

(MEMORANDUM.)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Committee's present Testing Station, it comprises an old mansion, standing in its own grounds, near Westbourne Park, and close to Royal Oak Station. The house is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. Any surplus is refunded. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

For the Executive,

EDWIN O. SACHS, *Chairman.*

EXPERIMENTAL FIRE TESTS

CONDUCTED BY THE EXECUTIVE

OF THE

BRITISH FIRE PREVENTION COMMITTEE.

[FOUNDED 1897—INCORPORATED 1899.]

FIRE TEST MA.—MAY 10TH, 1901.

A Floor of Steel Joists and Coke Breeze Concrete.

OBJECT OF TEST.

To record the effect of a fire of two and a half hours' duration, commencing with a temperature of 500° Fahr., gradually increasing to a temperature not exceeding 2300° Fahr., followed at the end of the two and a half hours by the application of a stream of water for two minutes, and the consequent rapid cooling.

Note.—The area of the floor under investigation to be 77 feet superficial in the clear (10 ft. by 7 ft. 3 in).

The time allowed for construction and drying was six weeks (Spring).

SUMMARY OF EFFECT.

After twelve minutes plastering began to fall from the soffit. Beyond this no other effect was observed during the test.

The fire did not pass through the floor.

On the application of water the soffit of the concrete, where struck by the water, was disintegrated for about ¾ in.

DESCRIPTION OF TESTING PLANT.

(*See Figs.* 1 *to* 4.)

The testing chamber was located at the Committee's Testing Station, and was known as "No. 4 Hut."

The chamber was constructed, as shown, of stock bricks with lime mortar, and measured 10 ft. by 10 ft. internally.

The ceiling of the floor tested was 9 ft. 6 in. above the pavement of the chamber.

The hut was covered in every night with tarpaulins.

The openings were bricked up on the morning of the test.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The gas was admitted through two mixing chambers of fire-brick, each 7 ft. 8 in. by 3 ft., as shown.

Two Roberts-Austen pyrometers were used for recording temperatures, the first to take a continuous record from point No. 5, and the second to take four observation records from points 1, 2, 3, 4.

There were two observation holes, one in the north wall and one in the south wall.

The draught holes were in the north and south walls.

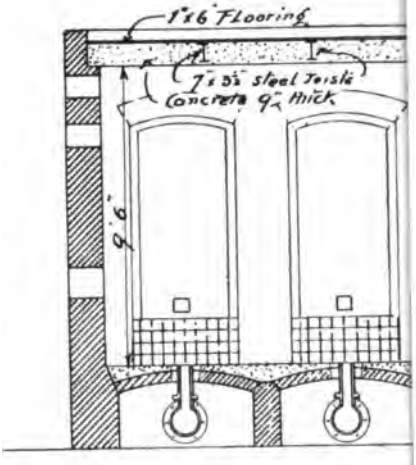
The photographs were taken by daylight.

The stream of water was applied through a branch with ½-inch nozzle, equipped with a pressure gauge, and supplied from a manual pump.

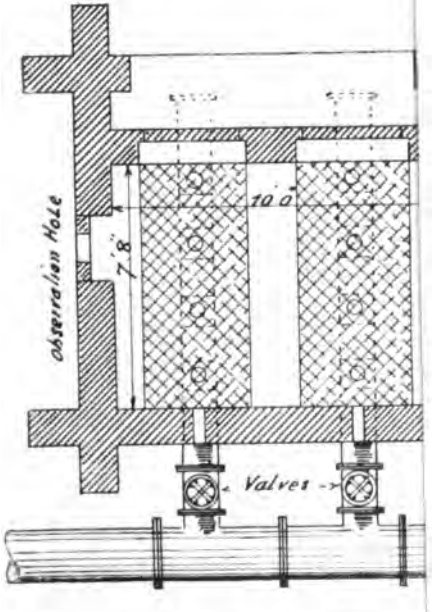
CONSTRUCTION OF THE FLOOR.

(*See Figs.* 1 *to* 4.)

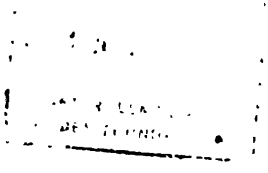
On March 26th wood centering for the support of concrete floor was erected. It was kept 2 in. below the steel joists.



SECTION LOOKING EA



PLAN OF HUT



On March 27th two 7-in. by 3½-inch steel joists, weighing 16 lbs. per foot run, were put up, running from east to west, and spaced 3 ft. 4 in. centres.

The concrete floor was then put in.

This consisted of coke-breeze and Portland cement in the proportion of 5 and 1. It was made in batches of ½ yard, was turned over three times dry and three times wet, 12·6 gallons of water being used to each ½ yard of material.

The concrete was carried to the roof in buckets, emptied, and spread out between the joists, and carried 2 in. below, and was, therefore, 9 in. thick. It was put in in two layers, well stamped down with the feet and a shovel, and levelled off.

On April 9th the centering was struck.

On April 11th the ceiling was covered with a setting coat of lime putty and plaster of Paris in the usual proportions.

Flooring, 1 in. by 6 in., was nailed directly on the top of the concrete floor.

There was no load on the floor.

THE TEST.

On May 10th the test was undertaken. The following is a log of the test:

At 2.45 p.m. the floor was intact.

At 3 p.m. the meteorological observations taken at the Botanical Gardens, Regent's Park, read as follows:

State of weather, overcast; Wind, N.N.E.; Barometer, 29.98 in.; Attached Thermometer, 53° Fahr.; Dry Bulb, 53° Fahr; Wet Bulb, 47·8° Fahr.; Dull afternoon, fair generally.

The table given on next page shows the temperatures taken from the four pyrometer observation points in the hut, as shown on the drawings Nos. 1, 2, 3, 4.

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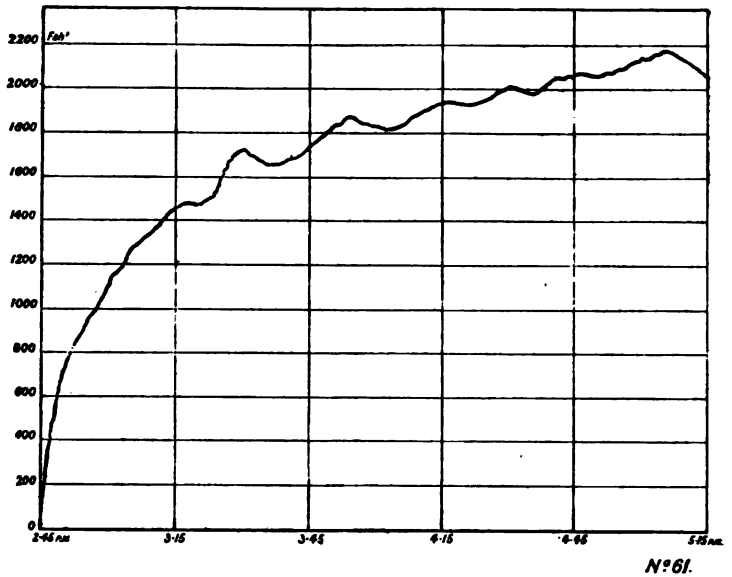
Observations taken at Points Nos. 1, 2, 3, 4.

From 2.50 *p.m. to* 5.15 *p.m.*

Time	No. 1	No. 2	No. 3	No. 4
2.50 p.m.	700° Fahr.	720° Fahr.	730° Fahr.	760° Fahr.
2.55 „	880° „	940° „	920° „	1000° „
3.0 „	1030° „	1140° „	1130° „	1150° „
3.5 „	1120° „	1320° „	1300° „	1260° „
3.10 „	1230° „	1420° „	1430° „	1380° „
3.15 „	1340° „	1525° „	1500° „	1440° „
3.20 „	1360° „	1540° „	1520° „	1460° „
3.25 „	1410° „	1650° „	1680° „	1550° „
3.30 „	1560° „	1800° „	1830° „	1670° „
3.35 „	1560° „	1760° „	1780° „	1620° „
3.40 „	1570° „	1760° „	1780° „	1640° „
3.45 „	1605° „	1810° „	1840° „	1710° „
3.50 „	1700° „	1860° „	1880° „	1780° „
3.55 „	1780° „	1920° „	1960° „	1850° „
4.0 „	1760° „	1860° „	1900° „	1820° „
4.5 „	1760° „	1860° „	1900° „	1810° „
4.10 „	1820° „	1930° „	1960° „	1860° „
4.15 „	1850° „	1960° „	2000° „	1900° „
4.20 „	1840° „	1980° „	2000° „	1900° „
4.25 „	1880° „	2000° „	2040° „	1930° „
4.30 „	1920° „	2050° „	2070° „	1980° „
4.35 „	1920° „	2040° „	2040° „	1940° „
4.40 „	1980° „	2090° „	2100° „	2022° „
4.45 „	2020° „	2120° „	2120° „	2060° „
4.50 „	2000° „	2120° „	2120° „	2060° „
4.55 „	2020° „	2140° „	2140° „	2060° „
5.0 „	2080° „	2200° „	2200° „	2130° „
5.5 „	2100° „	2220° „	2230° „	2160° „
5.10 „	2060° „	2180° „	2180° „	2120° „
5.15 „	2000° „	2100° „	2100° „	2000° „



AUTOMATIC RECORD AT POINT NO. 5.

At 2.45 p.m. the gas was turned on.

At 2.47 p.m. about half a yard of the setting coat fell off the soffit in the centre, and from this time till 3.30 p.m. patches of plaster continued to fall at intervals. This was the only effect to record.

At 5.15 p.m. the test was concluded, and, on the gas being turned off, the underside of the floor was incandescent.

At 5.17 p.m. water was applied to the underside of floor for two minutes, at a pressure of about 15 to 20 lbs. The result was that further portions of the plaster, where struck by the water, fell down.

The fire had not passed through the floor.

On removing one of the floor-boards, the top flange of the joists was sufficiently cool to bear the hand.

The underside of floor-boards was only stained by the steam from the concrete.

OBSERVATIONS AFTER TEST.

(*See Fig.* 5.)

On May 11th the photograph shown in Fig. 5 was taken.

On May 11th, at 2.55 p.m., the floor was examined, when most of the plastering had fallen, and what remained was loose and disintegrated.

The cracks, about $\frac{1}{10}$th of an inch wide, existed in line with the bottom flange of the steel joists.

The soffit of the concrete, where struck by the water, was disintegrated for about $\frac{3}{4}$ in.; otherwise the concrete was sound.

There was no deflection in the floor.

The floor-boards were sound and unaffected, as was also the top surface of the concrete.

GENERAL ARRANGEMENTS.

The test was carried out in accordance with the procedure laid down by the Executive for investigations of this description, and conducted by a sub-committee comprising:—

Mr. Ellis Marsland, District Surveyor, Camberwell (*Directing Member*).
Mr. Max Clarke, A.R.I.B.A.
Mr. Chas. E. Goad, M. Am. Soc.C.E., M.Can.Soc.C.E.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended the instrument room.

Mr. Edwin O. Sachs was in attendance on behalf of the Executive.

Signed,

For the Sub-Committee conducting Test:

ELLIS MARSLAND (*Directing Member*).

For the Commercial Section:

FREDERIC R. FARROW.

For the Executive:

EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.

H. S. TAYLOR
(*Assist. Secretary*).

Date—November 1, 1901.

LONDON:
PRINTED BY WILLIAM CLOWES AND SONS, LIMITED,
STAMFORD STREET AND GREAT WINDMILL STREET.

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PUBLICATIONS OF THE
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Edited by Edwin O. Sachs.

FIRE TESTS WITH CEILINGS

A WOOD FLOOR AND CEILING PROTECTED BY AN ADDITIONAL SUSPENDED CEILING

BY

BANKS FIREPROOF CONSTRUCTION SYNDICATE, LTD., LONDON

THE COMMITTEE'S REPORT.

LONDON, 1911

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(*Founded 1897—Incorporated 1899*)
1 WATERLOO PLACE, PALL MALL.

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OBJECTS OF THE COMMITTEE:

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

NOTE.

THE Report presented deals with the effect of a severe fire upon a suspended ceiling attached to an ordinary wood floor and ceiling in order to afford additional protection against the risk of fire, the Firm undertaking the test being desirous of showing that existing floors of an ordinary character can be protected by addition from below, and without considerable reconstruction.

EDWIN O. SACHS.

LONDON,
October 30, 1901.

THE GENERAL ARRANGEMENTS FOR TESTS.

(MEMORANDUM.)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Committee's present Testing Station, it comprises a house, standing in its own grounds, near Royal Oak Station, and backing on to the Great Western Railway. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

For the Executive,

EDWIN O. SACHS, *Chairman.*

OFFICIAL REPORT

OF THE

BRITISH FIRE PREVENTION COMMITTEE.

[FOUNDED 1897—INCORPORATED 1899.]

FIRE TEST No. 30. MAY 22nd, 1901.

A Wood Floor and Ceiling
Protected by
An Additional Suspended Ceiling,

BY

BANKS' FIREPROOF CONSTRUCTION SYNDICATE, LTD.
LONDON.

OBJECT OF TEST.

To record the effect of a fire of ninety minutes' duration, gradually increasing to a temperature of 2000° Fahr., followed by the application of water for two minutes from below.

SUMMARY OF EFFECT.

In 3 minutes portions of the setting coat of the suspended ceiling began to fall, and continued to fall throughout the test. On the application of water, a portion of the floating coat was washed away, exposing a small part of the lathing.

No fire was observed to have passed through the floor up to the conclusion of the test.

Note.—20 minutes after the test had concluded the wood floor caught fire, and was extinguished.

Following the test, an examination was made on May 24th, when, on removing the floor boards on top, it was found that the wood laths to a portion of the ceiling in the centre, for about one yard superficial, had been consumed, and the under side of the wood joists was charred, and the ceiling had fallen away. The rest of the plastering and joists were sound, and the general stability of the floor unaffected.

DESCRIPTION OF TESTING PLANT.

(*See Figs.* 1 *to* 4.)

The testing chamber used was located at the Committee's Testing Station, and was known as No. 1 Hut.

The hut was constructed, as shown, of stock bricks, with lime mortar, and measured 10 ft. by 10 ft. internally.

The ceiling of the floor tested was 8 ft. above the pavement of the chamber. The soffit of the suspended ceiling was 3¼ in. lower.

The door opening on the west side measured 2 ft. by 6 ft.

The fuel used was gas produced at the Station, and the supply was regulated by valves and dampers.

The gas was admitted through two mixing chambers of fire-brick, each 7 ft. 8 in. by 3 ft. 4 in., as shown.

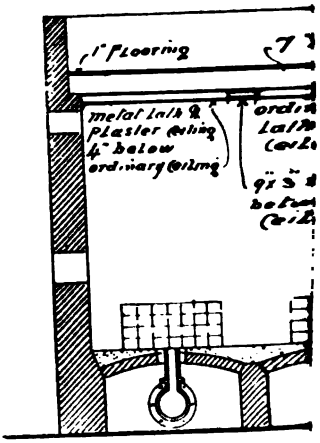
Two Roberts-Austen pyrometers were used for recording temperatures, the first to take a continuous record from point No. 5, and the second to take four observation records from points Nos. 1, 2, 3, 4.

There were two observation holes in the north and south walls, and two small observation holes in the east wall.

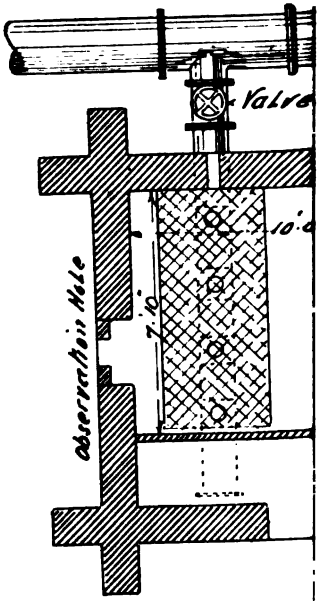
The ventilation holes were in the north and south walls.

The photographs were taken by daylight.

Water was applied through a branch with ½-in. nozzle, equipped with a pressure gauge, and supplied from a manual fire-pump.



SECTION LOOK



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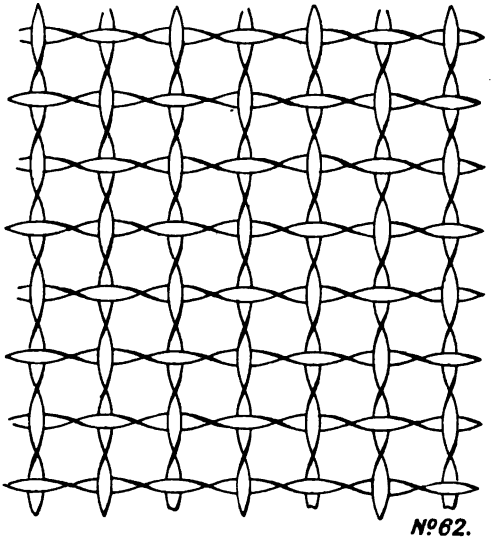
CONSTRUCTION OF THE FLOOR CEILINGS.

(*Figs.* 1 *to* 4, *and* 5 *to* 8.)

On March 18th, 1901, 7-in. by 2½-in. wooden joists, previously used, were fixed on the walls running north and south, spaced about 12 in. apart, with rough boarding on top.



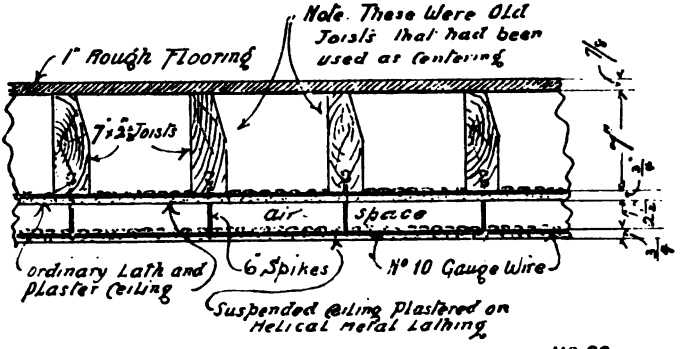
The ceiling lathing was of fir laths, butt-jointed, fixed with galvanised iron nails.

On March 19th the ceiling was plastered one coat, with mill-made coarse stuff, which was brought to the Testing Station all ready mixed, and was said to consist of lime, sand and hair, to which was added 50 per cent. of Portland cement.

On March 20th the second coat was put on. This was of similar material.

The total thickness when finished was 1 in.

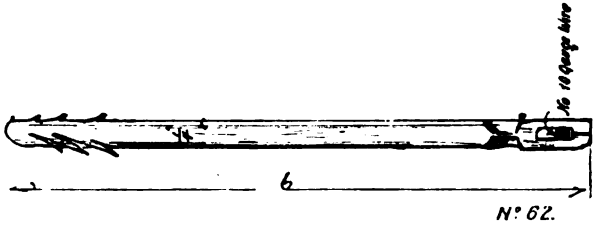
A second ceiling, suspended 3¼ in. below the first, was formed by driving 6 in. iron spikes into the wood joists, about 12 in. apart. These spikes were jagged at one end, the other being flattened, and having an elongated eye-hole through which No. 10 gauge wire was threaded.


Note. These were Old Joists that had been used as Centering
1" Rough Flooring
7"x2½" Joists
air-space
ordinary Lath and plaster Ceiling
6" Spikes
N° 10 Gauge Wire
Suspended Ceiling plastered on Helical Metal Lathing

N° 62.

DETAIL OF FLOOR

The lathing was kept in position by wedge-shaped pins driven below the lathing in the remaining space of the eye-hole.



N° 62.

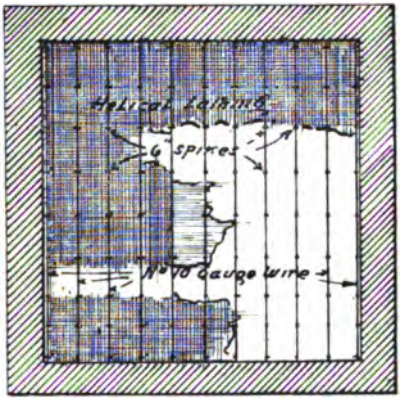
The sheets of lathing were bound together at their edges with No. 16 gauge annealed wire.

There was an air space between the two ceilings, and four openings, 9 in. by 3 in., were made, one in each of the four walls of the hut.

On April 3rd the first coat of plaster was put on the suspended ceiling. This was similar to that above described.

On April 4th the second coat was put on. This was similar to the first coat.

On April 7th the finishing coat was put on. This was done in Portland cement and sand, with a trowelled face. The total thickness when finished was 1 inch.



N° 82.

The ceiling was then allowed to stand until May 22nd, when the test was undertaken.

THE TEST.

On May 22nd, 1901, the test was undertaken. The following is the log of the test:

At 2 p.m. the floor and ceiling were intact.

At 2 p.m. the meteorological observations taken at the Botanical Gardens, Regent's Park, read as follows:

State of weather, clouds; Wind, E.S.E.; Barometer, 30·25 ins.; Attached Thermometer, 63° Fahr.; Wet Bulb, 53° Fahr.; Dry Bulb, 66·5° Fahr.; Remarks, fresh varying breezes, fine afternoon.

The following temperature observations were taken during the test from points Nos. 1, 2, 3, 4.

TIME.	No. 1.	No. 2.	No. 3.	No. 4.
2.10 p.m.	880° Fahr.	840° Fahr.	300° Fahr.	300° Fahr.
2.15 „	1060° „	1030° „	400° „	420° „
2.20 „	1200° „	1140° „	600° „	650° „
2.25 „	1320° „	1220° „	700° „	700° „
2.30 „	1430° „	1330° „	800° „	500° „
2.35 „	1520° „	1460° „	1580° „	900° „
2.40 „	1640° „	1600° „	1520° „	700° „
2.45 „	1720° „	1760° „	1600° „	500° „
2.50 „	1780° „	1790° „	1650° „	—
2.55 „	1860° „	1840° „	1700° „	—
3.0 „	1880° „	1620° „	1750° „	—
3.5 „	1900° „	1860° „	1800° „	—
3.10 „	2000° „	1900° „	1904° „	—
3.15 „	2060° „	1980° „	1900° „	1700° „
3.20 „	2060° „	2000° „	1920° „	1700° „
3.25 „	2100° „	2020° „	1920° „	1600° „
3.30 „	2000° „	1940° „	1900° „	1640° „

Note.—The temperatures at point No. 4 between 2.50 and 3.10 fluctuated so much that it was decided to omit the readings. The junction was changed, but the readings, which still fluctuated in a strange way, showed some curious draught in the hut itself.

OBSERVATIONS (OUTSIDE).

At 2.5 p.m. gas turned on and lighted.

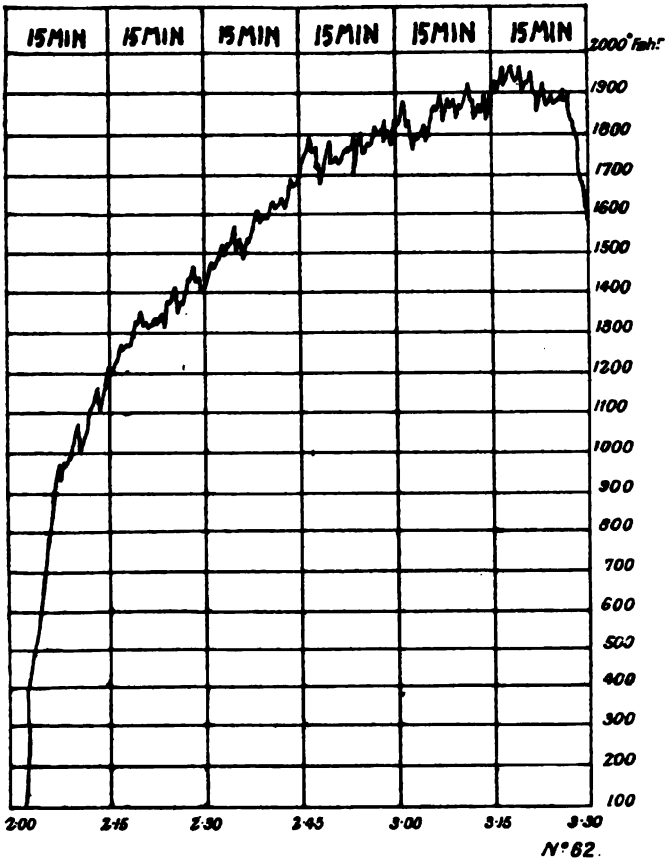
At 2.10 p.m. vapour appeared on the top of floor, near the centre, on north and south sides, close to the walls.

At 2.13 p.m. vapour increasing on south side.

At 2.14 p.m. smoke appeared out of vent-hole over door-opening.

At 3.15 p.m. no change on top, but two or three boards slightly curled.

At 3.30 p.m. pressure of gas turned off.
At 3.35 p.m. water turned on.
At 3.37 p.m. water turned off, and test closed.



AUTOMATIC RECORD AT POINT-5.

OBSERVATIONS (INSIDE).

At 2.5 p.m. gas lighted.

From 2.9 p.m. to 2.27 p.m. portions of setting coat falling, with detonations.

At 3.35 p.m. gas shut off.

At 3.35 p.m. water applied for two minutes, which washed away a portion of the floating coat in the centre of ceiling, exposing a small portion of lathing.

At 3.40 p.m. the test was concluded.

No. 62.

VIEW TAKEN AFTER FLOORING HAD BEEN REMOVED, SHOWING CONDITION OF JOISTS AND TOP SIDE OF INNER CEILING.

OBSERVATIONS AFTER TEST.

At 3.55 p.m. floor joists caught fire about centre of floor and flames came out at ventilating openings. Water was applied.

Under side.

About two yards of the setting coat of the suspended ceiling remained, mostly at the north and south ends.

Most of the floating coat had come away with the setting coat, exposing the pricking coat.

VIEW TAKEN BEFORE TEST, AT 1.50 P.M. No. 62.

VIEW TAKEN AFTER TEST, AT 4 P.M. No. 62.

The metal lathing was exposed in places, and perforated at eight points in the mesh.

The ceiling had sagged in the centre slightly.

Top side.

On removing some of the floor boards it was found that the fire had come through the wood lath and plaster ceiling at about the centre, and had consumed the wooden laths between the third, fourth and fifth joists from the east end for about two-thirds of their length.

The soffits of four of the joists were charred at the bottom and sides for about two-thirds of their length, and the plastering had dropped away. The rest of the plastering and joists were sound and unaffected by the fire.

The general stability of the floor was unaffected.

GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive, comprising—

Mr. F. Hammond, F.R.I.B.A.
Mr. Ellis Marsland, District Surveyor, Camberwell.
Mr. Charles E. Goad, M. Am. Soc. C.E.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended in the Instrument Room.

The Council was represented by—

Mr. H. H. Collins, Past President, District Surveyors' Association.
Major-General E. R. Festing, C.B. (South Kensington Museum).
Mr. W. A. Hart (G. W. R. Co.).

The Executive was represented by—

Mr. Edwin O. Sachs (Chairman).
Mr. T. E. Gatehouse, F.R.S.Ed.
Mr. Ed. Woodthorpe, M.A., F.R.I.B.A.

The Members' Testing Sub-Committee was represented by—

Mr. G. E. Monckton, M.A.

The general body of Members was represented by—

Mr. W. H. A. Berry, A.R.I.B.A.—Mr. T. F. Britton (L. G. Omnibus Co.)—Mr. F. Sizer Capon (Architect's Department, L.C.C.)—Mr. J. H. Colls—Mr. Bernard Dicksee, A.R.I.B.A., District Surveyor, East Newington—Mr. Bryan Donkin, M.Inst.C.E., M.Inst.M.E.—Mr. E. Dru Drury, F.R.I.B.A., F.S.I.—Mr. T. Dyson, Chief Officer, Fire Brigade, Windsor—Mr. A. J. L. Evans, Borough Engineer and Surveyor, Luton—Mr. W. M. Fawcett, F.R.I.B.A.—Mr. Horace S. Folker (Hon. Gen. Sec. Fire Brigades' Union)—Mr. W. Grellier, F.R.I.B.A.—Mr. Killingworth Hedges, M.Inst.C.E., M.Inst.E.E.—Mr. E. R. Hewitt, A.R.I.B.A., District Surveyor, St. Saviour's, Southwark—Mr. Thomas Leach, Chief Officer, Fire Brigade, Wimbledon—Mr. George McDonell, A.R.I.B.A., District Surveyor, Islington—Mr. J. R. Manning, M.S.A.—Mr. J. W. Metcalf, A.M.Inst.C.E.—Mr. R. P. Notley, F.R.I.B.A., F.S.I.—Mr. C. E. Parker-Rhodes—Mr. A. Saxon Snell, F.R.I.B.A.—Mr. H. H. Statham, F.R.I.B.A.—Mr. H. W. Tinné, J.P.—Mr. Thomas Wilkins, F.G.S.—Major Winn, R.E.

The Commercial Section was represented by—

Mr. F. R. Farrow, F.R.I.B.A. (Chairman)—Mr. H. Coward (Messrs. Davenport & Coward)—Mr. J. H. Crittall (The Crittall Manufacturing Co.)—Mr. G. Davenport (Messrs. Davenport & Coward)—Mr. J. F. Golding (The New Expanded Metal Company)—Mr. Brees van Homan (Messrs.

Homan & Rogers)—Mr. J. D. O'Brien (The Columbian Fireproofing Co.)—Mr. T. Potter (Potter & Co.)—Mr. A. Reid (Messrs. Anderson & Son)—Mr. E. R. Runnacles (The Crittall Manufacturing Co.) — Mr. J. H. Sankey (Messrs. Sankey & Son) — Mr. W. H. Strode (Messrs. Strode & Co.)—Mr. Hubert Todd (Messrs. W. B. Wilkinson & Co.)—Mr. F. Wallers (Messrs. Dowson, Taylor & Co.) —Mr. A. Williams (Messrs. G. A. Williams & Sons).

Messrs. Banks' Fireproof Construction Syndicate, Ltd., was represented by—

Mr. T. Lewis Banks, F.R.I.B.A.; Mr. L. C. Banks; Mr. Drew-Bear; Mr. A. Pye-Smith; Mr. T. Simpson.

The following visitors attended by special invitation of the Executive:

Mr. H. A. Ball; Mr. W. Banister (Messrs. Barry, Head & Co.); Mr. J. B. Becker; Mr. J. H. Beckett (Railway Clearing House); Mr. J. W. Beckey; Mr. R. J. Collier; Mr. J. Cowper (Columbian Fireproofing Co.); Mr. H. F. Donaldson; Mr. H. Dru Drury; Mr. E. Duckham, C.E.; Mr. E. Enoch; Mr. Chas. Gude; Mr. A. Louis Guye; Mr. C. S. Halse; Mr. J. Hart; Mr. H. C. Higgins; Mr. A. James (Messrs. James & Edwards); Mr. Arthur Morris; Mr. John C. T. Murray (Admiralty); Admiral Sir Henry Nicholson, K.C.B.; Mr. Richard Perkins; Mr. R. Randall Phillips; Mr. H. Plummer; Mr. F. W. Schafer; Mr. H. B. Squire; Mr. G. J. Stubbings (G. E. R. Co.); Mr. Philip Spier; Mr. W. A. Thomas; Mr. Frank Turton; Mr. F. W. Wann; Mr. Winks; Mr. Wm. Young, F.R.I.B.A.; Mr. Chas. Young; and Mr. A. E. Brown.

Signed,

For the Sub-Committee conducting the Test:
F. HAMMOND (*Directing Member*).

For the Commercial Section:
FREDERIC R. FARROW.

For the Executive:
EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.

H. S. TAYLOR
(*Assist. Secretary*).

Date—October 23, 1901.

Verified a true copy of the Report ordered to be published.

WILLIAMSON, HILL & CO.
(*Solicitors*).

Date—November 2, 1901.

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PUBLICATIONS OF THE
BRITISH FIRE PREVENTION COMMITTEE.—No. 63.
Edited by Edwin O. Sachs.

228371

FIRE TESTS WITH PARTITIONS

A PARTITION

ERECTED BY

BANKS' FIREPROOF CONSTRUCTION SYNDICATE, LTD.

LONDON

The Committee's Report

LONDON, 1901

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE.
(*Founded 1897—Incorporated 1899*)
1 WATERLOO PLACE, PALL MALL.

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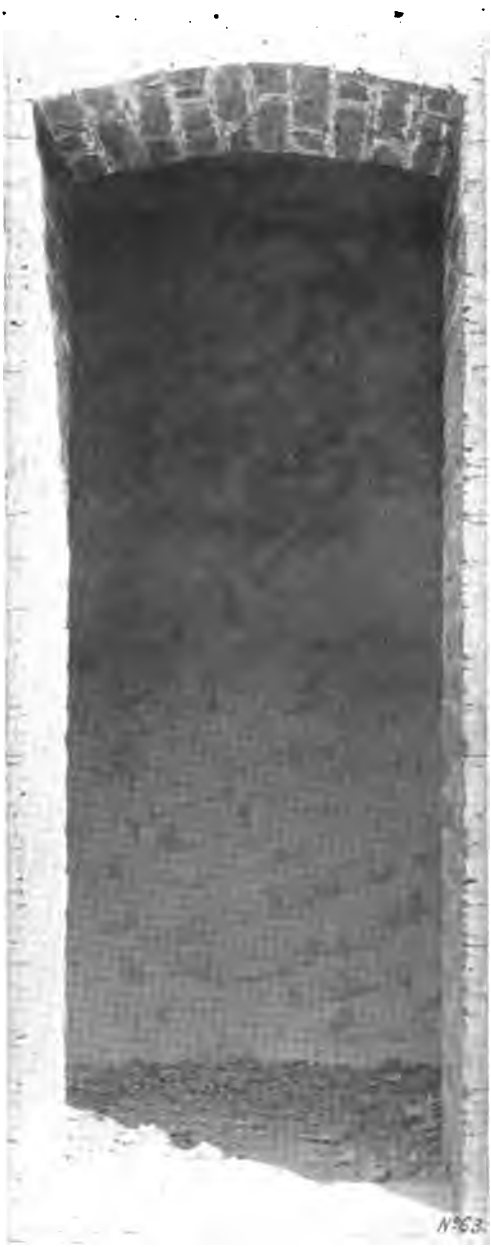

Fig. 6. VIEW TAKEN ON MAY 16TH, 1901.
WEST SIDE OF PARTITION THROUGH OPENING.

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BRITISH FIRE PREVENTION COMMITTEE—No. 63.

Edited by Edwin O. Sachs.

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THE COMMITTEE'S REPORT

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LONDON, 1901

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(*Founded* 1897—*Incorporated* 1899)
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Two Shillings and Sixpence

Fig. 6. VIEW TAKEN ON MAY 16TH, 1901.
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26. FIRE TESTS WITH DOORS. A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
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33. FIRE TESTS WITH GLASS. A Casement glazed with ¼-in. Plate Glass; a Casement glazed with 32 oz. Sheet Glass; a Casement glazed with "Lead Lights."
34. FIRE TESTS WITH FLOORS. A Floor of Steel Joists with Coke Breeze Concrete.
35. FIRE TESTS WITH DOORS. A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels; a 2-in. Framed Deal Door with 2-in. Solid Panels.
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37. FIRE TESTS WITH PARTITIONS. A Partition erected by the "Gypsine" Brick Company, Ltd., London and Paris.
38. FIRE TESTS WITH FLOORS. A Floor by the "Gypsine" Brick Co., Ltd., London and Paris.
39. FIRE TESTS WITH DOORS. A 2-in. Framed Honduras Mahogany Door with 2-in. Solid Panels; a 2-in. Framed Poplar Door with 2-in. Solid Panels.
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1 WATERLOO PLACE, PALL MALL, LONDON, S.W.

OBJECTS OF THE COMMITTEE:

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

NOTE.

THE Report published herewith deals with a light partition, the fire-resistance of which is a subject calling for the attention of architects.

The question of the construction of thin, light, fire-resisting partitions is one that is gaining importance from year to year, owing to the necessity of economising space, and the Executive consider that any contributions they are able to make in respect to the matter should be of considerable value for technical and professional purposes

EDWIN O. SACHS

LONDON,
November 15, 1901.

THE GENERAL ARRANGEMENTS FOR TESTS.

(MEMORANDUM.)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Committee's present Testing Station, it comprises a house, standing in its own grounds, near Royal Oak Station, and backing on to the Great Western Railway. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

For the Executive,

EDWIN O. SACHS, *Chairman.*

OFFICIAL REPORT

OF THE

BRITISH FIRE PREVENTION COMMITTEE.

[FOUNDED 1897—INCORPORATED 1899.]

FIRE TEST No. 31. MAY 22ND, 1901.

A PARTITION

ERECTED BY

BANKS' FIREPROOF CONSTRUCTION SYNDICATE, LTD.
LONDON.

OBJECT OF TEST.

To record the effect of a fire of ninety minutes' duration, gradually increasing to a temperature of 2000° Fahr., followed by the application of water from fire side.

SUMMARY OF EFFECT.

Soon after the gas was lighted, a considerable portion of the setting and floating coats on the inside of the partition blew off with loud reports.

Various small cracks appeared on the outside of the partition, through which vapour escaped. The fire did not pass through the partition.

DESCRIPTION OF TESTING PLANT.

(*See Figs.* 1, 2, 3, 4.)

The testing chamber used was located at the Committee's Testing Station, and was known as No. 1 Hut

The hut was constructed, as shown, of stock bricks, with lime mortar, and measured 10 ft. by 10 ft. internally.

The ceiling was 8 ft. above the pavement of the hut.

The door opening in the west wall measured 2 ft. by 6 ft.

The fuel used was gas produced at the Station, and the supply was regulated by valves and dampers.

The hut was divided, as shown on plan, the partition being constructed from north to south, the full width and height of the hut, leaving a passage on the outside 1 ft. 11 in. wide. The size of the chamber was 7 ft. 10 in. by 10 ft.

The gas was admitted through two mixing chambers of fire-brick, each 7 ft. 8 in. by 3 ft. 4 in., as shown.

Two Roberts-Austen pyrometers were used for recording temperatures, one taking a continuous record from point No. 5, and one being used for the observation record at points Nos. 1, 2, 3, 4, all of which were in the chamber; and a hanging thermometer was placed in the passage.

There were two observation holes, one in the north and one in the south wall, and two small observation holes in the east wall.

The stream of water was applied to the fire side of partition through the south observation hole by a branch with a ½-in. nozzle, supplied from a manual fire-pump.

The ventilation holes were in the north and south walls.

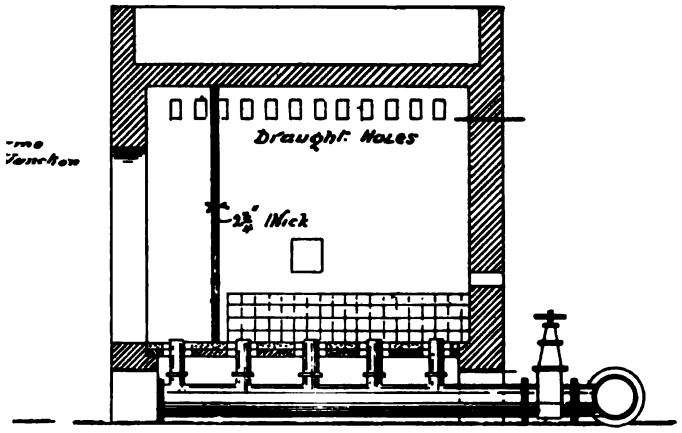
CONSTRUCTION OF THE PARTITION.

(*See Fig.* 5.)

The partition was 10 ft. by 8 ft., and was constructed in the following manner:—

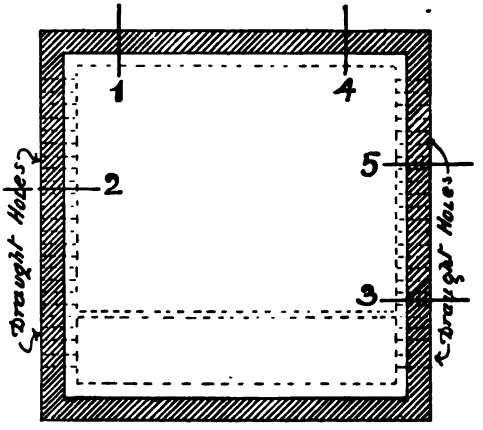
1-inch channel irons were secured to each wall and to the floor joists above with iron wall-hooks. Between the channel irons, and spaced 2 ft. apart, 1 in. by 1 in. star-shaped studs were put up from floor to ceiling, and secured to joists with wall-hooks, as before described.

Corrugated helical lathing ¾-in. mesh was fixed between



SECTION LOOKING NORTH

Note. Points marked 1·2·3·4·5 are Thermo Junctions attached to Wires Leading to Pyrometers. N° 5 is self recording



PLAN of ROOF

Figs. 1, 2, 3 AND 4. PLANS AND SECTIONS.

the studs, and secured thereto with No. 16 gauge annealed wire about 8 in. to 10 in. apart. Between the iron studs there was an iron bar $\frac{1}{2}$ in. wide by $\frac{1}{8}$ in. thick, which was

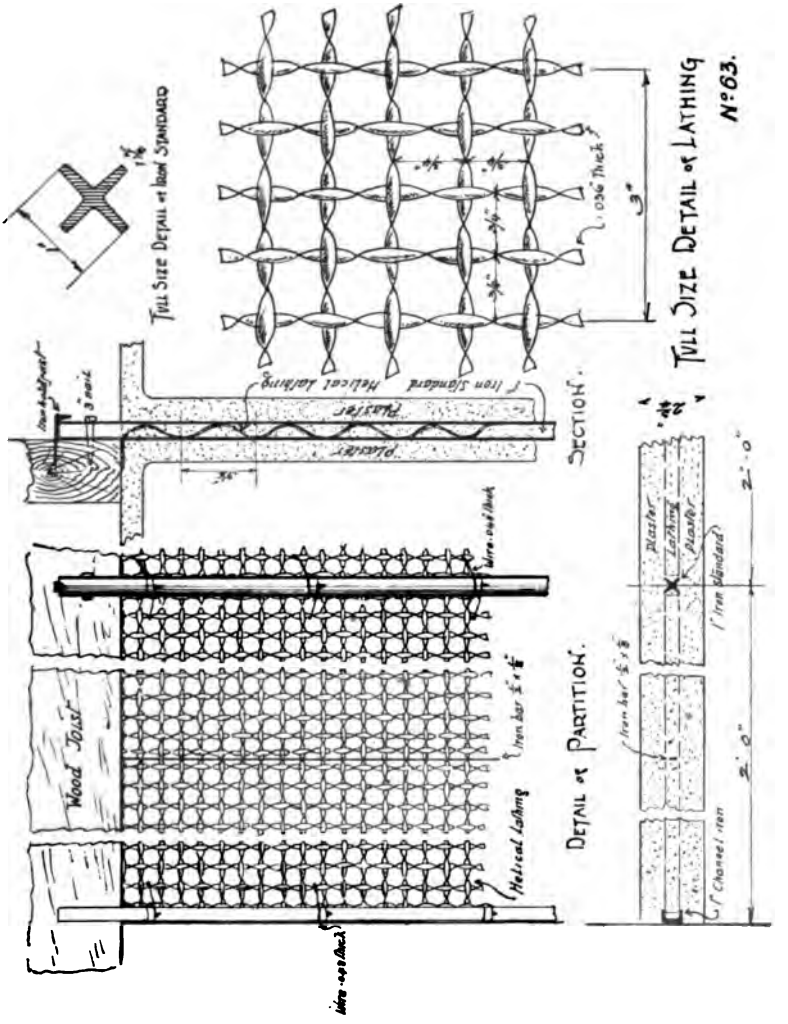


Fig. 5. DETAILS OF THE PARTITION.

228374

carried from floor to ceiling through every alternate mesh of lathing to prevent sagging.

On March 28 the partition was plastered both sides, one coat with mill-made coarse stuff, which was brought to the Testing Station already mixed, and was said to consist of lime, sand and hair, to which were added 50 per cent. of Portland cement.

On March 29 the second coat was put on; this was of similar material.

On April 7 the finishing coat was put on. This was done in Portland cement and sand with a trowelled face.

The partition, when finished, averaged $2\frac{3}{4}$ in. thick.

THE TEST.

On May 22, 1901, the test was undertaken. The following is the log of the test:—

At 3 p.m. the meteorological observations, taken at the Botanic Gardens, Regent's Park, read as follows:—

State of weather, clouds; Wind, E.S.E.; Barometer, 30·25 in.; Attached Thermometer, 63° Fahr.; Wet Bulb, 53° Fahr.; Dry Bulb, 66·5 Fahr.; Remarks, fresh varying breezes, fine afternoon.

Observations from the outer (West) side.

At 2.5 p.m. the gas was turned on and lighted; hanging thermometer 65°.

At 2.7 p.m. smoke appeared in passage.

At 2.15 p.m. black smoke appeared under partition south side of opening.

At 2.18 p.m. hair cracks appeared in upper part of partition, from which moisture exuded.

At 2.21 p.m. thick smoke in passage as before, but increasing in volume.

At 2.25 p.m. hair cracks appeared in lower part of partition, centre of opening.

At 2.27 p.m. temperature of hanging thermometer 75°.

At 2.29 p.m. vesiculated vapour out of lower crack, condensing on face of partition about 2 ft. from floor.

At 2.31 p.m. large quantity of vapour issuing from crack near ceiling.

At 2.35 p.m. temperature of hanging thermometer 84°.

At 2.43 p.m. the photograph shown in Fig. 7 was taken.

At 2.51 p.m. temperature of hanging thermometer 105°.

At 2.56 p.m. partition hot to touch, but would not ignite a wax vesta. The cracks before mentioned in lower part of partition widening.

At 3.27 p.m. temperature of hanging thermometer 128°.

Observations from the fire side.

On May 16 and 22 the photographs shown in Figs. 6 and 7 were taken.

At 2.5 p.m. the gas was lighted.

At 2.11 p.m. about 4 yards of the setting coat blew off with loud report.

At 2.16 p.m. more of the setting coat blew off.

At 2.20 p.m. about 3 yards of the floating coat blew off.

At 3.35 p.m. the gas was turned off, and test concluded.

At 3.35 p.m. water was applied for two minutes, when a further portion of the floating coat fell where struck by the water, exposing the first or pricking-up coat.

OBSERVATIONS TAKEN FROM POINTS NOS. 1, 2, 3, 4 AND 5.

Time.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	Average
	Deg. F.	Deg. F.	Deg. F.	Deg. F.		Deg. F.
2.10	880	840	300	300	Continuous	580
2.15	1060	1030	400	420	Record	727
2.20	1200	1140	600	650	„	897
2.25	1320	1220	700	700	„	1005
2.30	1430	1330	800	500	„	1015
2.35	1520	1460	1580	900	„	1365
2.40	1640	1600	1520	700	„	1365
2.45	1720	1760	1600	500	„	1395
2.50	1780	1790	1650	..	„	1740
2.55	1860	1840	1700	..	„	1800
3.0	1880	1620	1750	..	„	1750
3.5	1900	1860	1800	..	„	1850
3.10	2000	1900	1900	..	„	1935
3.15	2060	1980	1900	1700	„	1920
3.20	2060	2000	1920	1700	„	1920
3.25	2100	2020	1920	1600	„	1930
3.30	2000	1940	1900	1640	„	1870

The temperatures of Junction 4 between 2.50 p.m. and 3.10 p.m. fluctuated so much that it was decided to omit the readings. The Junction was changed, to prove the readings, which still fluctuated in this strange way, showing some curious draught in the Hut itself.

(Signed) H. B. WHITE.

OBSERVATIONS AFTER TEST.

On May 23 the photographs shown in Figs. 8 and 9 were taken.

Inside.

The setting coat was nearly all off, except about 1 yard in various patches, mostly at bottom and right and left corners.

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The floating coat was nearly all off, except for about 2 yards.

The pricking-up coat remained ; the lathing was partly exposed at the corrugations. Portions of two of the iron studs were exposed on the north side, and vertical cracks in the plastering indicated the position of the other two.

Outside.

The face of the partition was cracked in various directions, but not bulged ; otherwise it was intact.

The fire had not passed through the partition.

Two holes were cut in the partition, one at the north lower corner, when the partition was found to be 3½ in. thick at this point; one was cut through at the top south end, and the thickness there was found to be 2¾ in.

GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive, comprising :—

Mr. F. Hammond, F.R.I.B.A.
Mr. Ellis Marsland, District Surveyor, Camberwell.
Mr. Chas. E. Goad, M.Am.Soc.C.E.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended in the Instrument Room.

The Council was represented by :—

Mr. H. H. Collins, Past President, District Surveyors' Association.
Major-General E. R. Festing (South Kensington Museum).
Mr. W. A. Hart (G.W.R. Co.).
Mr. Alexander Siemens, Past President, Inst. E.E.

The Executive was represented by :—

Mr. Edwin O. Sachs (Chairman).
Mr. T. E. Gatehouse, F.R.S.Ed.
Mr. Ed. Woodthorpe, M.A., F.R.I.B.A.

The Members' Testing Sub-Committee was represented by :—

Mr. G. E. Monckton, M.A.

The general body of Members was represented by :—

Mr. W. H. A. Berry, A.R.I.B.A.—Mr. T. F. Britton (L. G. Omnibus Co.)—Mr. F. Sizer Capon (Architect's Department, L.C.C.)—Mr. J. H. Colls—Mr. Bernard Dicksee, A.R.I.B.A., District Surveyor, East Newington—Mr. Bryan Donkin, M.Inst.C.E., M.Inst.M.E.—Mr. E. Dru Drury, F.R.I.B.A., F.S.I.—Mr. T. Dyson, Chief Officer, Fire Brigade, Windsor—Mr. A. J. L. Evans, Borough Engineer and Surveyor, Luton—Mr. W. M. Fawcett—Mr. Horace S. Folker (Hon. Gen. Sec. National Fire Brigades' Union)—Mr. W. Grellier, F.R.I.B.A.—Mr. Killingworth Hedges, M.Inst.C.E., M.Inst.E.E.—Mr. E. R. Hewitt, A.R.I.B.A., District Surveyor, St. Saviour's, Southwark—Mr. Thomas Leach, Chief Officer, Fire Brigade, Wimbledon—Mr. George McDonell, A.R.I.B.A., District Surveyor, Islington—Mr. J. R. Manning, M.S.A.—Mr. J. W. Metcalf, A.M.Inst.C.E. —Mr. R. P. Notley, F.R.I.B.A., F.S.I.—Mr. C. E. Parker-Rhodes—Mr. A. Saxon Snell, F.R.I.B.A.—Mr. H. H. Statham, F.R.I.B.A.—Mr. H. W. Tinné, J.P.—Mr. Thomas Wilkins, F.G.S.—Major Winn, R.E.

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Homan & Rodgers)—Mr. J. D. O'Brien (The Columbian Fireproofing Co.)—Mr. T. Potter (Potter & Co.)—Mr. A. Reid (Messrs. Anderson & Son)—Mr. E. R. Runnacles (The Crittall Manufacturing Co.)—Mr. J. H. Sankey (Messrs. Sankey & Son)—Mr. W. H. Strode (Messrs. Strode & Co.)—Mr. Hubert Todd (Messrs. W. B. Wilkinson & Co.)—Mr. F. Wallers (Messrs. Dowson, Taylor & Co.)—Mr. A. Williams (Messrs. G. A. Williams & Sons).

Messrs. Banks' Fireproof Construction Syndicate, Ltd., was represented by :—

Mr. T. Lewis Banks, F.R.I.B.A.; Mr. L. C. Banks; Mr. A. Pye-Smith; Mr. T. Simpson.

The following visitors attended by special invitation of the Executive :—

Mr. H. A. Ball; Mr. W. Banister (Messrs. Barry, Head & Co.); Mr. J. B. Becker; Mr. J. H. Beckett (Railway Clearing House); Mr. J. W. Beckey; Mr. R. J. Collier; Mr. J. Cowper (Columbian Fireproofing Co.); Mr. H. F. Donaldson (Royal Arsenal, Woolwich); Mr. H. Dru Drury; Mr. Drew-Bear; Mr. E. Duckam, C.E.; Mr. E. Enoch; Mr. Chas. Gude; Mr. C. S. Halse; Mr. J. Hart; Mr. A. Louis Guye; Mr. H. C. Higgins; Mr. A. James (Messrs. James & Edwards); Mr. Arthur Morris; Mr. John C. T. Murray (Admiralty); Admiral Sir Henry Nicholson, K.C.B.; Mr. Richard Perkins; Mr. R. Randall Phillips; Mr. H. Plummer, Mr. F. W. Schafer; Mr. H. B. Squire; Mr. G. J. Stubbings (G.E.R. Co.); Mr. Philip Spier; Mr. W. A. Thomas; Mr. Frank Turton; Mr. F. W. Wann; Mr. Winks; Mr. W. M. Young, F.R.I.B.A.; Mr. Charles Young and Mr. A. E. Brown (Brown's Patent Kiln, Ltd.).

Signed,

For the Sub-Committee conducting the test:
F. HAMMOND (*Directing Member*).

For the Commercial Section:
FREDERICK R. FARROW.

For the Executive:
EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.

H. S. TAYLOR
(*Assist. Secretary*).

Date—November 13, 1901.

Verified a true copy of the Report ordered to be published.

WILLIAMSON, HILL & CO.
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ATIONS OF THE
BRITISH FIRE PREVENTION COMMITTEE.—No. 64.
Edwin O. Sachs.

IRE TESTS WITH FLOORS

A FLOOR

BY

BANKS' FIREPROOF CONSTRUCTION SYNDICATE, LTD.

LONDON

The Committee's Report

LONDON, 1901

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(*Founded 1897—Incorporated 1899*)
1 WATERLOO PLACE, PALL MALL

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OBJECTS OF THE COMMITTEE:

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

NOTE.

THE Report presented herewith deals with a test which is of larger area than any conducted heretofore, the size of the floor being 22 ft. by 10 ft., and the report is therefore worthy of special consideration.

EDWIN O. SACHS.

LONDON,
December 10, 1901.

THE GENERAL ARRANGEMENTS FOR TESTS.

(MEMORANDUM.)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Committee's present Testing Station, it comprises a house, standing in its own grounds, near Royal Oak Station, and backing on to the Great Western Railway. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

For the Executive,

EDWIN O. SACHS, *Chairman.*

Figs. 9, 10, 11. THE FLOOR.—VIEWS FROM BELOW, AFTER TEST.

OFFICIAL REPORT

OF THE

BRITISH FIRE PREVENTION COMMITTEE.

[FOUNDED 1897—INCORPORATED 1899.]

FIRE TEST No. 32. MAY 22, 1901.

A FLOOR

BY THE

BANKS' FIREPROOF CONSTRUCTION SYNDICATE, LTD.

OBJECT OF TEST.

To record the effect of a fire of three hours' duration, commencing with a temperature of 500° Fahr., gradually increasing to a temperature not exceeding 2500° Fahr., followed at the end of the three hours by the application of a stream of water for two minutes, and the consequent rapid cooling.

Note.—The area of the floor under investigation to be 222 ft. 6 in. superficial in the clear (10 ft. by 22 ft. 3 in.). The floor was to be loaded with 200 lbs. per ft. distributed.

The time allowed for construction and drying was about two months (Spring and Summer).

SUMMARY OF EFFECT.

The floating and setting coat of the plaster on the under side of the suspended ceiling blew off in patches during the test.

On the application of water some more of the plaster fell off the soffit of the ceiling.

The concrete and steel joists forming the floor deflected during the test to a maximum of 2¼ in., but returned to within 1 in. of level on cooling and removal of the load.

The fire did not pass through the floor.

On the removal of the load the concrete was found to be cracked in the direction of the steel joists.

DESCRIPTION OF TESTING PLANT.

(See Figs. 1 to 4.)

The testing chamber was located at the Committee's Testing Station, and was known as "No. 2 Hut."

The chamber was constructed, as shown, of stock bricks, with lime mortar, and measured 10 ft. by 22 ft. 3 in. internally.

The ceiling of the floor tested was 7 ft. 11 in. above the pavement of the chamber.

The hut was roofed in every night either with galvanised iron or tarpaulins.

The door-openings on the north, south and west sides measured 2 ft. by 6 ft., and were closed by being filled in with half brickwork 4½ in. thick.

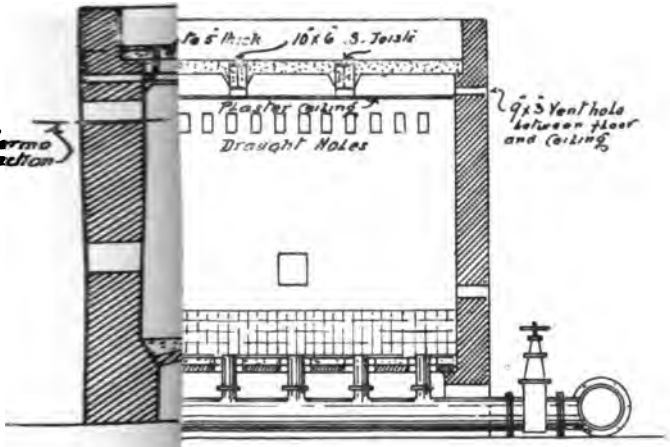
The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The gas was admitted through four mixing chambers of firebrick, each 10 ft. by 3 ft., as shown.

Two Roberts-Austen pyrometers were used for recording temperatures, the first to take a continuous record from point 9, and the second to take eight observation records from points 1, 2, 3, 4, 5, 6, 7, 8.

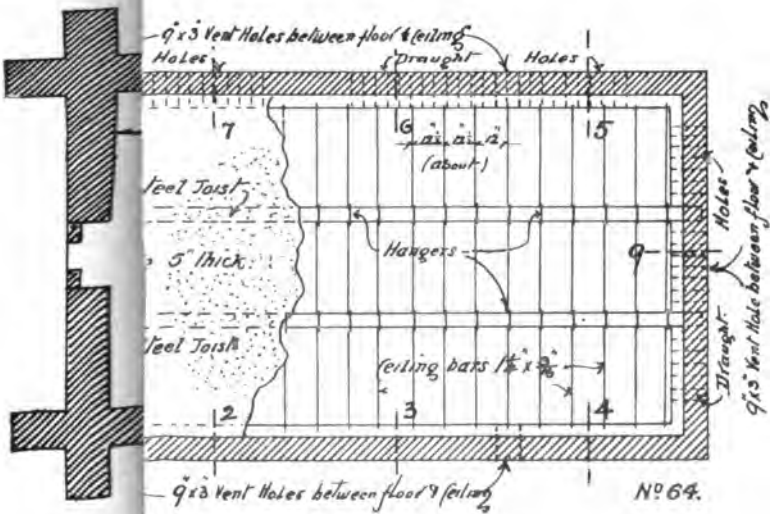
The load was of bricks, distributed evenly on the surface of the floor.

There were four observation holes in the east wall, one in the south wall, one in the north wall, and two in the west wall, the last four being formed in the bricked-up door-openings, and each covered with a movable iron shutter.



CTION LOOKING HORTH

1·2·3·4·5·6·7·8·9·10 are attached to Wires Leading and 10 are Self recording



PLAN of FLOOR

The draught holes were in the east, north and south walls.

The photographs were taken partly by daylight and partly by flashlight.

The stream of water was applied through a branch with ½-in. nozzle, equipped with a pressure gauge, and supplied from a manual pump similarly equipped.

CONSTRUCTION OF THE FLOOR.

(*See Figs.* 1 *to* 8.)

The construction of the floor, illustrated in Figs. 1 to 8, was as follows :

On March 13 two 10 in. by 6 in. steel joists, weighing 42 lbs. per ft., were placed in position on the walls running

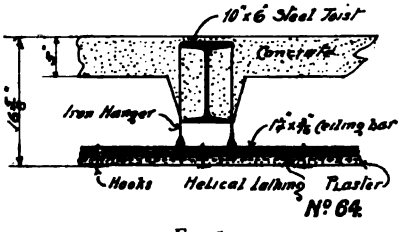


Fig. 5.

north and south, and resting 12 in. on the walls at each end. The ends of joists were not fixed into the walls, but left free with ends exposed. The joists were spaced 3 ft. 4 in. centre to centre.

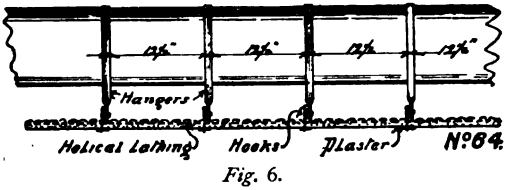


Fig. 6.

Over the joists, and spaced about 12½ in. apart, were put wrought-iron hanging straps 14¾ in. long, ¾ in. wide, and $\frac{3}{16}$ in. thick. Steel ceiling bars 1¼ in. wide and $\frac{3}{16}$ in. thick were bolted thereto with ¼ in. bolts.

Note.—These bars, to which was to be hung the suspended ceiling, were used for the support of the centering, some of which were unbolted at one end to allow of the centering being taken down. The ceiling bars were then replaced and securely bolted.

Over the ceiling bars special hooks were placed for the support of the metal lathing which was attached thereto

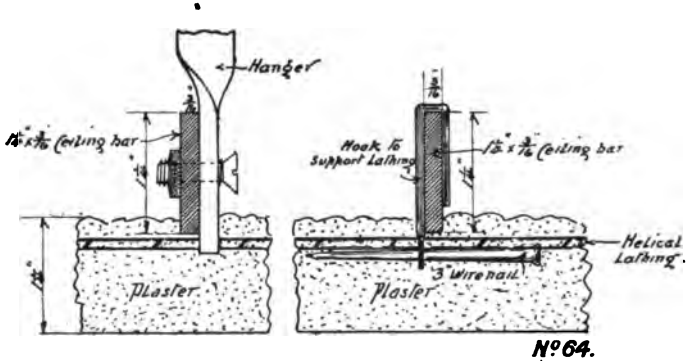


Fig. 7.

and pressed home to the under side of ceiling bars, and through the eye of the hooks a 3 in. wire nail was inserted to secure the lathing. The edges of lathing were overlapped one strand and bound together with No. 18 annealed wire. Steel helical lathing ¾ in. mesh, ·036 in. thick, was used.

On March 16 and 17 the concrete floor was put in. This consisted of pan breeze brought from the Old Kent

Road Gas Works, mixed with Portland cement in the proportion of 5 and 1. The breeze was fairly damp before being used. The concrete was turned over twice dry and twice wet, and while the water was being put on it was

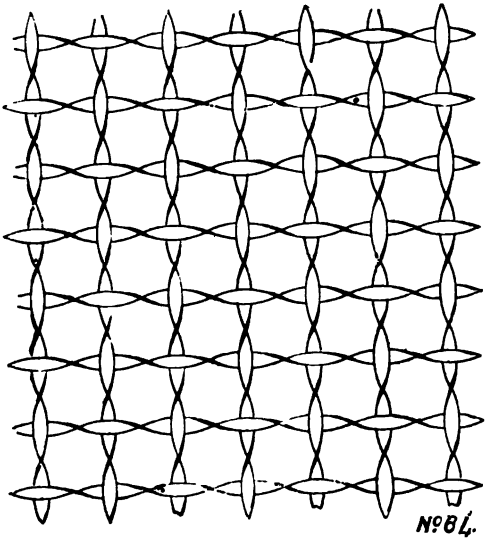


Fig. 8.

again turned over by degrees ; 9·62 gallons of water were used to each ½ yard of material.

The concrete was taken to the floor in buckets and distributed over the surface, and stamped down with the feet and the flat side of a shovel.

The floor was 5 in. thick, and the concrete was carried down the sides of the steel joists to the bottom flange and 1 in. above the top flange, the joists except the lower flange being encased in the concrete.

On March 25 the centering was removed and the helical lathing before referred to was put up.

On March 29 the first coat of plaster was put on. This was mill-made coarse stuff brought to the Testing Station ready made, and was said to consist of lime, sand and hair

in the proportion of 2 parts of coarse stuff to 1 part of Portland cement, with 8 lbs. of hair to each yard of material.

On March 30 the second coat was put on; this was composed of the same material as the first coat.

On April 2 the last or finishing coat was put on. This was composed of Portland cement with trowelled face. The total thickness was $1\frac{1}{4}$ in.

Between the floor and suspended ceiling an air space was obtained by leaving out six 9 in. by 3 in. vent-holes in the walls open to the outer air.

During and after construction the floor was protected by being covered with tarpaulins till the morning of the test.

PREPARATIONS FOR TEST.

On May 16 several cracks were observed in the plaster ceiling, running in all directions, particularly at the north end from east to west.

On May 16 the floor was loaded with 5450 stock-bricks, equal to a distributed load of 200 lbs. per sq. ft. over an area of 17 ft. by 8 ft. (136 sq. ft.).

The tarpaulin was finally removed on the morning of May 22, before the test began.

THE TEST.

On May 22 the test was undertaken. The following is a log of the Test:

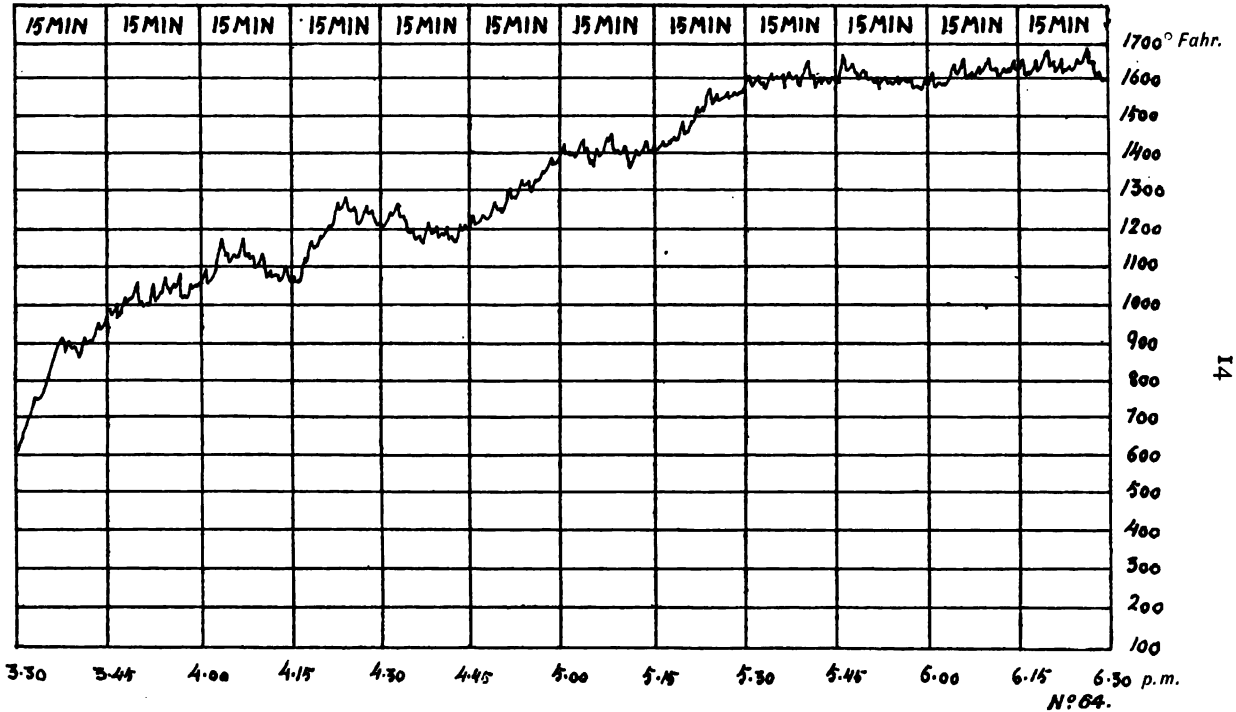
At 3 p.m. the meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows:

State of weather, clouds; Wind, E.S.E.; Barometer, 30·25 in.; Attached Thermometer, 63° Fahr.; Dry Bulb, 66·5° Fahr.; Wet Bulb, 53° Fahr.; Remarks, fresh varying breezes, fine afternoon.

OBSERVATIONS TAKEN AT POINTS NOS. 1, 2, 3, 4, 5, 6, 7, 8.

From 3.35 *p.m. to* 6.30 *p.m.*

Time.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.
	Deg. F.	Deg. F.	Deg. F.	Deg. F.	Deg. F.	Deg. F.	Deg. F.	Deg. F.
3.35	700	500	820	900	700	700	700	600
3.40	840	600	900	980	860	820	800	760
3.45	840	560	880	1000	900	900	820	800
3.50	900	510	950	1220	1130	940	900	870
3.55	1000	520	1000	1300	1140	980	940	940
4.0	920	540	1040	1300	1160	960	960	960
4.5	1000	600	1100	1360	1200	1120	1000	1000
4.10	1020	620	1020	1400	1180	1080	1020	1040
4.15	1000	600	1100	1320	1140	1040	1000	1000
4.20	1100	680	1120	1400	1300	1100	1100	1120
4.25	1200	700	1200	1500	1380	1200	1160	1160
4.30	1220	800	1240	1500	1340	1200	1200	1200
4.35	1220	800	1240	1480	1320	1200	1180	1180
4.40	1200	800	1240	1420	1280	1180	1180	1180
4.45	1200	840	1200	1500	1320	1200	1200	1200
4.50	1300	900	1300	1500	1380	1220	1220	1220
4.55	1340	920	1300	1580	1400	1260	1260	1260
5.0	1400	960	1340	1600	1440	1320	1320	1320
5.5	1420	1000	1400	1620	1500	1340	1340	1340
5.10	1420	1000	1400	1680	1460	1360	1360	1360
5.15	1420	1020	1400	1640	1500	1400	1400	1400
5.20	1500	1060	1420	1700	1500	1420	1420	1420
5.25	1560	1080	1500	1710	1520	1460	1460	1460
5.30	1600	1120	1530	1760	1660	1510	1510	1510
5.35	1620	1160	1560	1760	1700	1540	1540	1540
5.40	1640	1200	1560	1760	1720	1560	1560	1560
5.45	1640	1200	1560	1760	1700	1540	1540	1540
5.50	1640	1240	1560	1780	1700	1580	1580	1580
5.55	1640	1220	1580	1740	1640	1550	1550	1550
6.0	1640	1260	1580	1760	1660	1540	1540	1540
6.5	1640	1260	1580	1800	1680	1680	1680	1680
6.10	1650	1300	1580	1780	1670	1560	1560	1560
6.15	1660	1300	1600	1810	1720	1600	1600	1600
6.20	1700	1320	1600	1820	1730	1600	1600	1600
6.25	1680	1300	1600	1800	1700	1580	1580	1580
6.30	1640	1300	1520	1700	1400	1500	1500	1500



AUTOMATIC RECORD AT POINT 9.

The table on p. 13 shows the temperatures taken from the eight pyrometer observation points in the hut, as shown on the drawing as Nos. 1, 2, 3, 4, 5, 6, 7, 8.

At 3.30 p.m. the ceiling and floor were intact except for the hair cracks before mentioned in the ceiling.

At 3.30 p.m. the gas was lighted.

At 3.36 p.m. large portions of the setting coat of ceiling fell (more than half).

At 3.45 p.m. most of the setting coat had fallen.

At 3.48 p.m. part of the second coat (about 6 ft. by 5 ft.) fell at N.W. corner.

At 3.51 p.m. more of second coat on W. side fell.

At 3.52 p.m. about 3 ft. by 2 ft. of second coat at N.E. corner fell.

At 4.5 p.m. steam issuing from vent-holes between floor and ceiling.

At 4.8 p.m. more of second coat fell on W. side.

At 4.14 p.m. more of the second coat fell on W. side.

At 4.17 p.m. cracks appeared in ceiling.

At 4.35 p.m. two cracks extending along centre of ceiling from N. to S. parallel to E. and W. walls.

At 4.50 p.m. most of the second coat fallen along W. side ; cracks not increased much.

At 5.50 p.m. ceiling still up and intact.

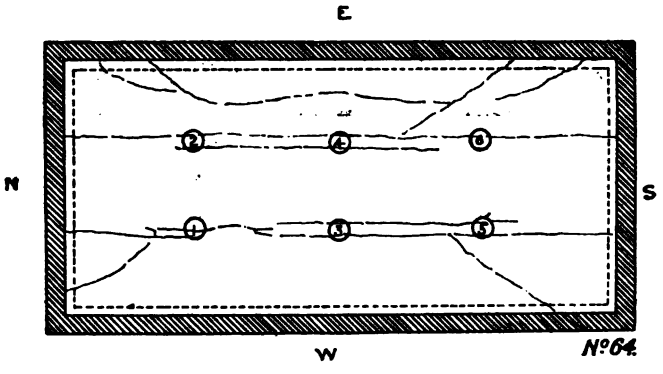
At 6.29 p.m. gas shut down.

At 6.30 p.m. water applied at pressure of about 20 lbs., which brought down some more of the second of plaster to ceiling as well as what remained of the setting coat.

The fire had not passed through the floor.

DEFLECTION OBSERVATIONS.

The deflections of the steel joists were taken by a level placed on the roof of an adjoining hut, and wooden staffs were placed at the points 1, 2, 3, 4, 5, 6 indicated on Fig. 4, the readings being taken every 10 minutes during the test.



PLAN SHOWING CRACKS VISIBLE ON TOP SURFACE OF FLOOR.
The numbers on the plan indicate the points at which the deflections were taken.

TABLE SHOWING DEFLECTIONS OF STEEL JOISTS.

Time.	Average Temperature.	1	2	3	4	5	6
	Deg. F.	in.	in.	in.	in.	in.	in.
3.30	0	0	0	0	0	0	0
3.40	410	0	0	0	0	$\frac{1}{8}$	$\frac{1}{8}$
3.50	820	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{1}{4}$
4.0	980	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{8}$	$\frac{3}{8}$
4.10	1047	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{2}$
4.20	1115	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{1}{2}$	$\frac{5}{8}$
4.30	1225	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{5}{8}$	$\frac{5}{8}$
4.40	1200	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{5}{8}$	$\frac{3}{4}$
4.50	1255	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{7}{8}$	1	$\frac{5}{8}$	$\frac{3}{4}$
5.0	1337	$\frac{5}{8}$	$\frac{5}{8}$	1	$1\frac{1}{8}$	$\frac{7}{8}$	1
5.10	1380	$\frac{7}{8}$	$\frac{3}{4}$	$1\frac{1}{8}$	$1\frac{3}{8}$	$\frac{7}{8}$	1
5.20	1430	$\frac{7}{8}$	$\frac{3}{4}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$\frac{7}{8}$	1
5.30	1525	$\frac{7}{8}$	$\frac{3}{4}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$\frac{7}{8}$	$1\frac{1}{8}$
5.40	1570	$\frac{7}{8}$	$\frac{7}{8}$	$1\frac{1}{4}$	$1\frac{1}{2}$	1	$1\frac{1}{4}$
5.50	1582	1	1	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{1}{8}$	$1\frac{3}{8}$
6.0	1565	1	1	$1\frac{5}{8}$	$1\frac{7}{8}$	$1\frac{1}{4}$	$1\frac{1}{2}$
6.10	1610	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{7}{8}$	$1\frac{3}{8}$	$1\frac{5}{8}$
6.20	1621	$1\frac{3}{8}$	$1\frac{1}{2}$	2	$2\frac{1}{8}$	$1\frac{3}{4}$	2
6.30	1602	$1\frac{1}{2}$	$1\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{1}{8}$	$1\frac{7}{8}$	2

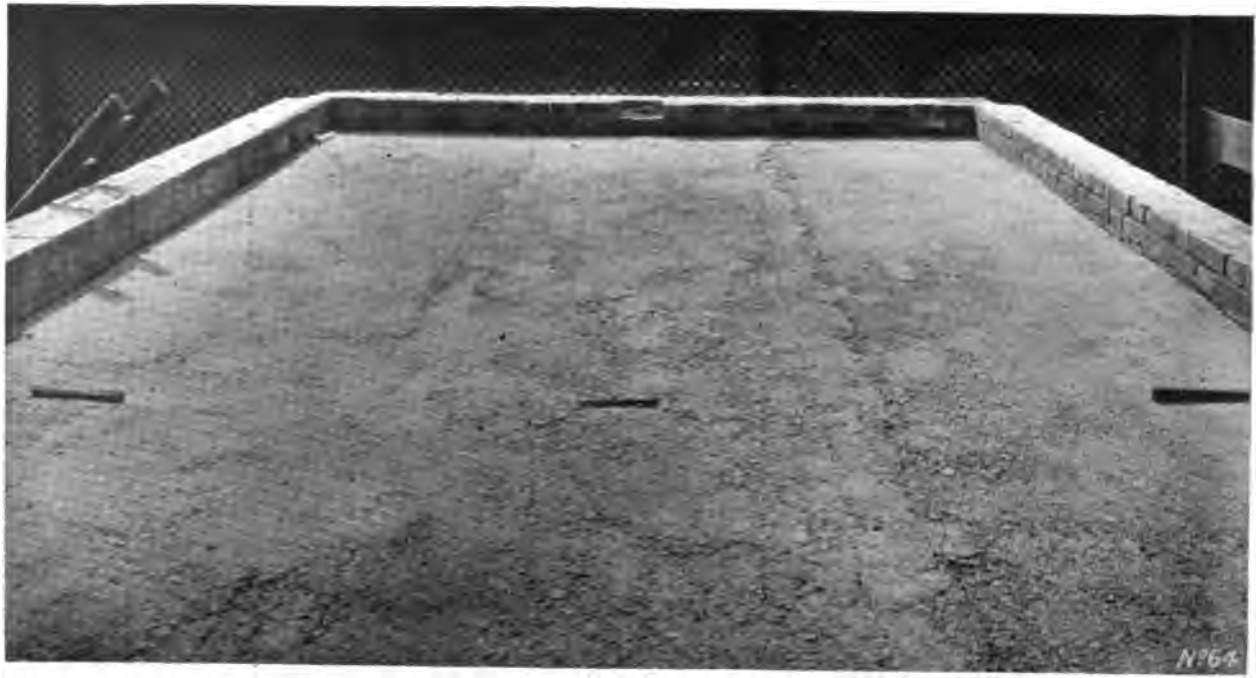


Fig. 12. THE FLOOR.—VIEW AFTER TEST, FROM ABOVE.

OBSERVATIONS AFTER TEST.

(*See Figs.* 9 *to* 13.)

On May 22 at 6.37 p.m. the top of the concrete was inspected and the side walls were leaning outwards, away from the edge of the concrete $1\frac{1}{4}$ in. in the centre, down to nothing at each end. The end walls were leaning outwards, away from the edge of the concrete 1 in. in the centre, down to nothing at the sides.

On May 24 and 25 the photographs shown in Figs. 9 to 13 were taken.

On May 24 the load was removed.

On May 24 the surface of the top of the floor showed the cracks indicated in plan on page 16. They varied from $\frac{1}{8}$ in. to $\frac{1}{20}$ in. wide.

The soffit of the suspended ceiling was as follows :

The first coat of plaster was intact and very little deteriorated.

Of the second coat about two-thirds remained.

Of the setting coat very little was left, and this in small patches at various parts.

The lathing had not sagged, but only followed the deflection of the joists.

The permanent deflection of the floor after the removal of the load was about 1 in.

The fire had not passed through the floor.

The concrete of the floor was sound and unaffected by the fire, except for the cracks above mentioned.

On November 27 the side walls were plumbed in the centre and found to be leaning over $\frac{5}{8}$ in. at the top. The edge of the concrete was $\frac{7}{8}$ in. clear of the wall at the east side and $\frac{1}{2}$ in. on the west side, when the above observations were made on November 27.

No further observations were made.

GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive, comprising—

Mr. Ellis Marsland, District Surveyor, Camberwell (Directing Member).
Mr. Ed. Woodthorpe, M.A., F.R.I.B.A.
Mr. T. E. Gatehouse, F.R.S.Ed.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.I.E.E., superintended in the Instrument Room.

The Council was represented by—

Mr. H. H. Collins, Past President, District Surveyors' Association.
Major-General E. R. Festing, C.B. (South Kensington Museum).
Mr. W. A. Hart (G.W.R. Co.).

The Executive was represented by—

Mr. Edwin O. Sachs (Chairman).
Mr. Chas. E. Goad, M.Am.Soc.C.E.
Mr. F. Hammond, F.R.I.B.A.

The Members' Testing Sub-Committee was represented by—

Mr. G. E. Monckton, M.A.

The general body of Members was represented by—

Mr. W. H. A. Berry, A.R.I.B.A.—Mr. T. F. Britton (L. G. Omnibus Co.)—Mr. F. Sizer Capon (Architect's Department, L.C.C.)—Mr. J. H. Colls—Mr. Bernard Dicksee, A.R.I.B.A., District Surveyor, East Newington—Mr. Bryan Donkin, M.Inst.C.E., M.Inst.M.E.—Mr. E. Dru Drury, F.R.I.B.A., F.S.I. (District Surveyor, Westminster)—Mr. T. Dyson, Chief Officer, Fire Brigade, Windsor—Mr. A. J.

L. Evans, Borough Engineer and Surveyor, Luton—M. W. M. Fawcett, F.R.I.B.A.—Mr. Horace S. Folker (Hon. Gen. Sec. National Fire Brigades' Union)—Mr. W. Grellier, F.R.I.B.A., District Surveyor, Clapham—Mr. Killingworth Hedges, M. Inst. C.E., M.I.E.E.—Mr. E. R. Hewitt, A.R.I.B.A., District Surveyor, St. Saviour's, Southwark—Mr. Thomas Leach, Chief Officer, Fire Brigade, Wimbledon —Mr. George McDonell, A.R.I.B.A., District Surveyor, Islington—Mr. J. R. Manning, M.S.A.—Mr. J. W. Metcalf, A.M. Inst. C.E.—Mr. R. P. Notley, F.R.I.B.A., F.S.I., District Surveyor, Bethnal Green—Mr. C. E. Parker-Rhodes—Mr. A. Saxon Snell, F.R.I.B.A.—Mr. H. H. Statham, F.R.I.B.A.—Mr. H. W. Tinné, J.P.—Mr. Thos. Wilkins, F.G.S.—Major Winn, R.E.

The Commercial Section was represented by—

Mr. F. R. Farrow, F.R.I.B.A. (Chairman)—Mr. H. Coward (Messrs. Davenport & Coward)—Mr J. H. Crittall (The Crittall Manufacturing Co.)—Mr. G. Davenport (Messrs. Davenport & Coward)—Mr. J. F. Golding (The New Expanded Metal Co.)—Mr. Brees van Homan (Messrs. Homan and Rodgers)—Mr. J. D. O'Briern (The Columbian Fireproofing Co.)—Mr. T. Potter (Potter & Co.)—Mr. A. Reid (Messrs. Anderson & Son)—Mr. E. R. Runnacles (The Crittall Manufacturing Co.)—Mr. J. H. Sankey (Messrs. Sankey & Son)—Mr. W. H. Strode (Messrs. Strode & Co.)—Mr. Hubert Todd (Messrs. W. B. Wilkinson & Co.)—Mr. F. Wallers (Messrs. Dowson, Taylor & Co.)—Mr. A. Williams (Messrs. G. A. Williams & Sons).

Messrs. Banks' Fireproof Construction Syndicate, Ltd., was represented by—

Mr. T. Lewis Banks, F.R.I.B.A.—Mr. L. C. Banks—Mr. T. Drew-Bear—Mr. A. Pye-Smith—Mr. T. Simpson.

The following visitors attended by special invitation of the Executive—

Mr. H. A. Ball; Mr. W. Banister (Messrs. Barry, Head & Co.); Mr. J. B. Becker; Mr. J. H. Beckett (Railway

229207

Clearing House); Mr. W. J. W. Beckey; Mr. R. J. Collier; Mr. J. Cowper (Columbian Fireproofing Co.); Mr. H. F. Donaldson (Royal Arsenal, Woolwich); Mr. H. Dru Drury; Mr. Drew-Bear; Mr. E. Duckham, C.E.; Mr. E. Enoch; Mr. Chas. Gude; Mr. C. S. Halse; Mr. J. Hart; Mr. A. Louis Guye; Mr. H. C. Higgins; Mr. A. James (Messrs. James & Edwards); Mr. Arthur Morris; Mr. John C. T. Murray (Admiralty); Admiral Sir Henry Nicholson, K.C.B.; Mr. Richard Perkins; Mr. R. Randall Phillips; Mr. H. Plummer; Mr. F. W. Schafer; Mr. H. B. Squire; Mr. G. J. Stubbings (G.E.R. Co.); Mr. Philip Spier; Mr. W. A. Thomas; Mr. Frank Turton; Mr. F. W. Wann; Mr. Winks; Mr. Wm. Young, F.R.I.B.A.; Mr. Chas. Young; and Mr. A. E. Brown.

Signed,

For the Sub-Committee conducting Test:
ELLIS MARSLAND.

For the Commercial Section:
FREDERIC R. FARROW.

For the Executive:
EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.

H. S. TAYLOR
(*Assistant Secretary*).

Date—November 27, 1901.

Verified a true copy of the Report ordered to be published.

WILLIAMSON, HILL & CO.
(*Solicitors*).

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GENERAL VIEW OF NEW TESTING STATION, NEAR WESTBOURNE PARK.

PUBLICATIONS OF THE
BRITISH FIRE PREVENTION COMMITTEE.—No. 65.
Edited by Edwin O. Sachs.

262650

THE

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OF

The British Fire Prevention Committee

Some Descriptive Notes

with

Illustrations

LONDON, 1902

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DISTRICT SURVEYOR, CAMBERWELL; HON. SEC. SOCIETY OF ARCHITECTS;
HON. SECRETARY OF THE BRITISH FIRE PREVENTION COMMITTEE;
CHAIRMAN OF THE TESTING STATION SUB-COMMITTEE

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31. FIRE TESTS WITH GLASS. Three Casements glazed with Wired Glass by Messrs. Pilkington, Bros.
32. FIRE TESTS WITH GLASS. Two Skylights glazed with Wired Glass by Messrs. Pilkington, Bros.
33. FIRE TESTS WITH GLASS. A Casement glazed with ¼-in. Plate Glass; a Casement glazed with 32 oz. Sheet Glass; a Casement glazed with "Lead Lights."
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35. FIRE TESTS WITH DOORS. A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels; a 2-in. Framed Deal Door with 2-in. Solid Panels.
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42. FIRE TESTS WITH SAFES. A Safe.
43. FIRE TESTS WITH PROTECTIVE COVERINGS. Girder Coverings by the "Gypsine" Brick Company, Ltd., London and Paris.
44. FIRE TESTS WITH PARTITIONS. A Partition erected by the Mural and Decorations Syndicate, Ltd., London.
45. FIRE TESTS WITH FLOORS. A Floor and Ceiling by the Mural and Decorations Syndicate, Ltd., London.
46. FIRE TESTS WITH FIRE-RESISTING CURTAINS. Two "Screen-Sail" Curtains by Mr. Rasmus Bugge.
47. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. D. Anderson & Son, Ltd., London, and Messrs. J. C. Broadbent & Co., Ltd., London.
48. FIRE TESTS WITH FLOORS. A Floor o Deal Joists and Coke-Breeze Concrete.

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OBJECTS OF THE COMMITTEE:

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

NOTE.

FREQUENT inquiries having reached the Offices of the Committee as to the character of its Testing Station, the following particulars and illustrations are published with the hope that the information afforded may be useful to the Members and those interested in the work of the Committee.

In presenting Mr. Marsland's notes, I should like to refer to those sentences which explain that the Committee are quite as anxious to undertake investigations with materials and systems that are *not* patented, or in any way subject to special makers' interests, as they are to try the so-called "fire-proof" specialities; but such tests with the *ordinary* materials and methods of construction can only be arranged as the funds of the Committee permit. Several tests of this character have already been undertaken, as may be seen by the published reports. Others will follow, from time to time, as funds permit.

Such general investigations being of the very highest importance to the community at large as well as the professions primarily interested, it is to be hoped that public authorities and allied technical societies will see their way to assist in this matter by subscribing to the Committee's funds. A series of systematic tests is the only way of obtaining the exact and reliable information so urgently required.

EDWIN O. SACHS.

LONDON,
15*th April*, 1902.

PUBLICATIONS of the BRITISH FIRE PREVENTION COMMITTEE

(*Continued from Second Page of this Publication*).

49. FIRE TESTS WITH DOORS. A 2¼-inch Door of Archangel Deal constructed in Three Thicknesses; a 2½-inch Door of Quebec Pine constructed in Three Thicknesses. Particulars of Experimental Fire Tests.

50. FIRE TESTS WITH DOORS. A 2¾-inch Door of Archangel Deal constructed in Three Thicknesses; a 1¾-inch Door of Teak, Flush Panelling on each side, the Panels being in Two Thicknesses. Particulars of Experimental Fire Tests.

51. FIRE TESTS WITH FIRE RESISTING CURTAINS. Two Fire Blinds, known as the "Williams" Fire Blinds, installed by G. A. Williams & Son, Bayswater, London. The Committee's Report.

52. FIRE TESTS WITH PARTITIONS. A Partition formed with "Mack" Patent Slabs, and erected by M. J. A. King & Co., London. The Committee's Report.

53. FIRE TESTS WITH PARTITIONS. A Partition known as the "Cunnah-Wright" Partition, by the Fireproof Partition Syndicate, Ltd., London. The Committee's Report.

54. FIRE TESTS WITH DOORS. A 2¾-inch Door of Oak constructed in Three Thicknesses; a 2¾-inch Door of Teak constructed in Three Thicknesses. Particulars of Experimental Fire Tests.

55. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke Breeze Concrete with Expanded Metal and Plaster Ceiling. Particulars of Experimental Fire Tests.

56. FIRE TESTS WITH FLOORS. A Floor by the Mural and Decorations Syndicate, Ltd., London, being a Double Test. The Committee's Report.

57. FIRE TESTS WITH TREATED WOOD. A Match-boarded Partition of Deal painted with Oil-colour; a Match-boarded Partition of "Non-Flammable" Deal painted with "Non-Flammable" Paint by the London Non-Flammable Wood Company, Ltd., London. The Committee's Report.

58. FIRE TESTS WITH PARTITIONS. A Partition known as the "Cunnah-Wright" Partition, by the Fireproof Partition Syndicate, Ltd., London. The Committee's Report.

59. FIRE TESTS WITH DOORS. An ordinary 4-Panelled Deal Door; an ordinary Ledged Deal Door. Particulars of Experimental Fire Tests.

60. FIRE TESTS WITH DOORS. Two Iron Doors. Particulars of Experimental Fire Tests.

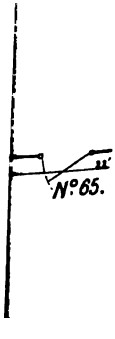
61. FIRE TESTS WITH FLOORS. A Floor of Steel Joists with Coke Breeze Concrete. Particulars of Experimental Fire Tests.

62. FIRE TESTS WITH CEILINGS. A Wood Floor and Ceiling protected by an Additional Suspended Ceiling by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.

63. FIRE TESTS WITH PARTITIONS. A Partition erected by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.

64. FIRE TESTS WITH FLOORS. A Floor by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.

65. The Testing Arrangements of the British Fire Prevention Committee. Some Notes with Illustrations. By ELLIS MARSLAND.


N°65.

VIEW OF ENTRANCE TO NEW TESTING STATION.

THE TESTING STATION.

INTRODUCTION.

THE object of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire resistance of the various materials, systems of construction, or appliances used in building practice. Such data have not as yet been available, owing to the fact that nearly all investigations in this direction have been carried out by individual makers or inventors with specific commercial objects in view. The few official tests hitherto made in the United States and on the Continent have, unfortunately, been only of minor importance, inasmuch as they were mostly organised to meet some special circumstance, such as the specification of work in a particular building or the framing of building regulations.

The series now undertaken by the Committee not only fulfils a want long felt by the professional man, but gives

"fire-proofing" trades, too, an opportunity to obtain authenticated records as to the reliability of their work.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute impartiality is assured, records being mostly taken automatically, and by photography, while the temperatures are carefully regulated and maintained, as the means for applying heat is by the combustion of gas.

All reports on tests state solely the bare facts and occurrences, with tables, diagrams and illustrations, and on no account include expressions of opinion, nor should any phrase be read as a comparison or criticism.

The general arrangement and direction of the tests is in the hands of the Executive, and in accordance with certain principles laid down after careful study and experiment.

The actual tests are attended by the members of the Council and the members of the Committee in rotation, care being taken that the attendance is always thoroughly representative of the technical professions primarily interested in the specific object under investigation.

The late Testing Station comprised two houses, standing in their own grounds, near Regent's Park, and backing on the Regent's Canal, but, owing to the land being required for railway extension, the Committee was obliged to vacate these premises.

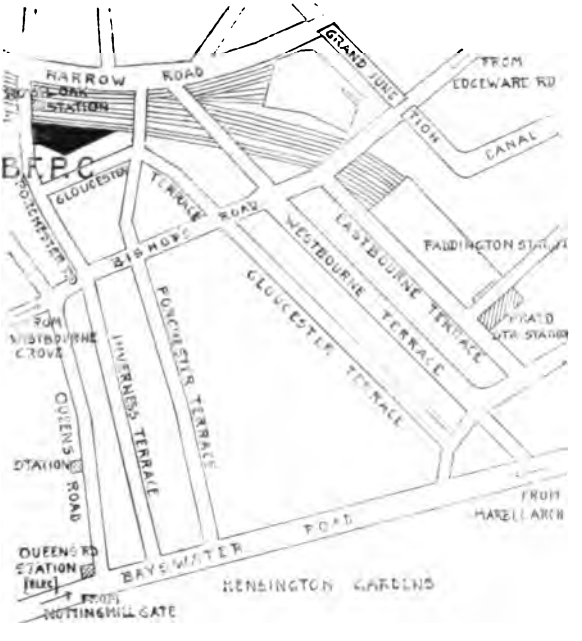
The present Testing Station is at Westbourne Lodge, 66 Porchester Road, Westbourne Park, W., and adjoins the Royal Oak Station of the Great Western Railway.

The premises comprise an old and commodious residence and garden. The principal rooms are used for Committee and Reception Rooms, a Museum, Laboratory and Photographic Dark Room, and also a residence for the Resident Engineer.

A portion of the garden is occupied by the huts in which tests are conducted.

The premises are accessible by rail or omnibus from any part of London, and are in telephonic communication (No. 1555, Paddington) with the offices of the Committee at No 1 Waterloo Place.

With regard to the financial aspect of the Station, the establishment expenses are met by a special subscription and, as far as the funds of the Committee permit, investigations with ordinary (i.e. not patented) forms of construc-



SITUATION OF NEW TESTING STATION

tion are undertaken from time to time, and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subjected to a scale of charges so regulated as to only just cover the actual cost. The Testing Station is also open to Members for such private research work or tests as they may desire to undertake, at nominal charges for loan of plant and instruments.

VIEW OF GAS GENERATOR AND PLANT AT THE OLD TESTING STATION.

The services of the Members participating in the management of the Station, conducting or attending tests, are given entirely gratuitously.

PLANT.

The plant actually completed comprises a set of testing huts, in which floors, partitions, doors or ceilings can be tested. The huts are laid down in two rows, their construction being explained on the plans and sections illustrated in this publication, as well as by the photographs showing some general views of the plant. The materials used in their construction are stock bricks with lime mortar.

The fuel used is gas, produced on the spot by a generator supplied by Messrs. Mason, of Longsight, Manchester, and a boiler by Messrs. Shand, Mason & Co., of Blackfriars Road.

The gas is conveyed from the generator by pipes to the several huts, and the supply is regulated by valves and dampers, and as the gas enters the huts from the branch pipes it is diffused by means of mixing chambers of fire-brick, as shown.

Each hut has door-openings, ventilation and observation holes, the doors being closed by brickwork during a test, and the ventilation holes blocked, according to requirements, by fire-brick or fire-clay.

Each chamber for a floor test allows for the floor under investigation to be placed at least 7 ft. 6 in. above the floor of the hut, and the chambers are roofed in with galvanised iron, or taupaulin, when necessary.

Bricks or pig-iron are used for any loads that may be applied to floors under investigation, and water is applied from an ordinary manual pump equipped with pressure gauge.

RECORDS.

Records of temperatures are taken, as far as possible, automatically, by electrical pyrometers designed by Professor Roberts-Austen, of the Royal Mint, and are able to record temperatures up to 2400° F.

A TEST IN OPERATION.

Visual observations as to work under investigation are also recorded, as far as possible, by photography.

Deflections are measured by level and staff, or by weights and pulleys.

ATTENDANCE AT TESTS.

The general arrangement and direction of the tests, as already explained, are in the hands of the Executive, the

work being done according to certain principles laid down by them after careful study and experiment.

The actual tests are attended by the members of the Council and the members of the Committee in rotation. Attendances at tests have to be strictly limited in accordance with the regulations of the Testing Station, for quite irrespective of the fact that any crowding disturbs those directing the operations, and that the actual attendance is by no means free from danger, there is the question of vibration—for instance, the movements of people in the house are distinctly felt on such delicate instruments as pyrometers.

For the regulation of the attendance at tests, with due consideration for the representation of the Committee—and also of the exhibitor, should it be the case of a patented piece of construction, system or appliance—the following arrangements are in force, and call for attention.

REGULATIONS FOR THE TESTING GROUND.

1. The official attendance at Tests with materials, systems or appliances of Members of the Commercial Section is limited to :—

The Council and Executive.
Ten Members of the Committee.
The Chairman of the Commercial Section.
Six Representatives of the Exhibitor.
Two Visitors nominated by the Exhibitor.
Such special Visitors as the Executive may invite.

2 Members and Visitors attending will be admitted by a card setting forth the conditions under which they attend, and they must sign an attendance book similarly setting forth these conditions, which are as follows :—

(i.) Members or Visitors attending a Test expressly undertake to in no way, directly or indirectly, publish or allow to be published, any description, account or criticism of the Test. Exhibitors, or their representatives, expressly undertake to in no way, directly or indirectly, publish or allow to

be published, any description, report, account or criticism of the Test, other than the duly authenticated official report of the Committee without abbreviation.

(ii.) Members, Exhibitors or Visitors shall in no way hold the Committee, its Council, Executive or Officers responsible for any personal or other injury, loss or damage sustained at a Test, or while visiting the Testing Station, whether through accident, negligence or otherwise.

(iii.) Members, Exhibitors and Visitors undertake to implicitly conform with the rules in force at the Testing Station, and to comply with all instructions given by the Executive or its representatives.

3. Every Test is in charge of a special Sub-Committee of the Executive, of whom one shall be the Directing Member. The complete technical direction is in their hands, and each Member of the Sub-Committee will wear a distinguishing badge.

4. A Member of the Executive will be delegated at each Test for the reception of Members and Visitors.

5. Members and Visitors will have at their disposal the two rooms known as the "Large and Small Committee Rooms." The room known as the "Lounge" will be reserved solely for the Executive, but all inquiries should be made at the Resident Engineer's Office at the Entrance Hall. All rooms marked "Private" are *strictly private.*

6. (*a*) The Members of the Sub-Committee in charge of any one Test, and the Officers and Employees of the Committee, must not be interfered with during the Test by Visitors and others wishing for explanations or information. (*b*) All inquiries should be put to the Members of the Executive specially delegated to receive Members and Visitors. (*c*) The Executive have powers to determine the distance within which Members and Visitors may not approach the testing huts, instruments or appliances during the progress of any Test. Nor shall any hut be entered or examined without special permission of the Directing Member of the Sub-Committee in charge of the Test, and any such permission shall involve no responsibility on the part of the "Directing Member," or that of the Executive, Council, Committee or its Officers.

7. For the execution of any one Test the Officers and Employees of the Committee will take their instructions only from the Directing Member of the Sub-Committee in charge of that Test, and will be responsible to him for their due execution.

BY ORDER OF THE EXECUTIVE.

THE COMMITTEE'S INVESTIGATIONS.

In respect to the ordinary building materials or forms of construction which are not subject to any patent or the interest of any special maker, investigations as to their fire-resistance are undertaken from time to time, according to means at the disposal of the Executive for such purposes. It rests with the Executive, either on their own initiative or at the instigation of others, to arrange for tests of this description, and it is hoped that the various public authorities interested in the subject will, in due course, contribute financially towards the cost of such experiments as they may consider of general public utility.

Up to the present the Executive have tested several floors of various constructions, as well as wood and iron doors.

It is needless to say that there are endless questions relating to the fire resistance of ordinary forms of construction that have yet to be solved, and it is hoped that further research will be made in this direction, as means permit.

The Executive hope, in due course, to be able to record the exact resistance of all the more common methods of construction used in the British Isles.

MAKERS' OFFICIAL TESTS.

As already indicated, quite irrespective of the tests undertaken by the Committee with work that is not subject to patents, or not the speciality of individual makers,

the fireproofing trade also have every opportunity for obtaining official and independent reports on their systems or appliances at a fixed tariff, the charges being based on the actual cost of such tests. Should the Executive find that these testing charges leave any material surplus, such surplus will, after due consideration of wear and tear of plant, instruments, etc., be utilised for improvements in the Committee's plant; but as a matter of fact experience has

WRECKAGE LAID OUT FOR INSPECTION.

shown that the charges only cover the expenses of the testing station when numerous tests are being carried out at short and regular intervals, whilst a loss is made on tests requiring special preparations.

The tariff reads as follows :—

For purposes of finance, the cost of the tests is divided into:— I. Preliminary expenses; II. Establishment capital; III. Testing charges.

All firms or individuals, not members of a firm desiring tests,

shall contribute a donation of £5 5*s*. to the preliminary expenses incurred by the British Fire Prevention Committee in forming the station.

All firms or individuals desiring tests shall contribute to the establishment capital of the station from £10 to £50, according to the nature of the test and the group to which it belongs, as defined below.

All firms desiring tests shall pay in form of testing charges

VIEW TAKEN DURING TESTING OPERATIONS.

from £50 to £125, according to the nature of the test and the group to which it belongs, as defined below.

These contributions and charges will cover all expenses for ground, carcass, walls, ovens or heating apparatus, instruments, firing, loading, water, attendance and supervision, and on no account shall any other expense be incurred; gratuities to the servants of the Committee, for instance, being strictly prohibited. No responsibility for breakage of instruments, etc., is incurred.

The firm or individual having work tested shall supply and fix

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his materials, systems, or appliances at his own cost, everything pertaining to the actual test being covered by his contributions as per scale.

The following classification of tests has been decided on with the view of fixing the contributions :—

Group A. Tests with built-up walls, floors, partitions, etc., safes, etc., intended to endure severe tests.

Group B. Tests with built-up walls, floors, partitions, etc., with plaster, special lathing, etc., and intended to stand medium tests.

Group C. Tests with individual pieces of material, with sprinklers, individual fittings, such as doors, glass panels, skylights, etc.

Group D. Tests with automatic appliances, such as fire-alarms, etc.

When second tests are desired by the same firm or individual the testing charge—no matter in what group—will be according to scale, but there will be no further contribution to the establishment capital or preliminary expenses. Where three or more tests are undertaken for the same firm or individual a discount of 10 per cent. off the scale charges will further be allowed. All contributions are payable in advance at such times as the Executive shall determine.

Before any test with any materials, system or appliance is started, or the arrangements for such a test are commenced, all contributions shall have been paid in advance, and the ordinary application for a test shall have been supplemented by an undertaking on the part of the firm or individual desiring the test, to accept all or any reports of the Committee, framed on the lines indicated above, and further to permit the Executive to issue such reports. The undertaking shall be on a form obtainable at the offices of the Committee. Any firm or individual, however, desiring to see the report on a test with his work prior to issue will always have an opportunity given him for this purpose.

Under exceptional circumstances, at the discretion of the Executive and under special conditions to be determined on, tests may be undertaken elsewhere than on the Committee's grounds.

The sum total of the contributions of an individual or firm undertaking a test in a single chamber will be as follows for any one of the four groups :—

Contributions for :	GROUP A. Tests with built-up walls, floors, partitions, etc., safes, etc., intended to endure severe tests.	GROUP B. Tests with built-up walls, floors, partitions, etc., with plaster, lathing, etc., intended to stand medium tests.	GROUP C. Tests with individual pieces of material, with sprinklers, individual fittings, such as doors, glass panels, skylights, etc.	GROUP D. Tests with automatic appliances, such as fire-alarms, etc.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
I. To preliminary expenses	5 5 0	5 5 0	5 5 0	5 5 0
II. To establishment capital	50 0 0	50 0 0	25 0 0	10 0 0
III. To testing charges .	125 0 0	100 0 0	75 0 0	50 0 0
Total . .	185 5 0	155 5 0	105 5 0	65 5 0

MAKERS' PRIVATE EXPERIMENTAL TESTS.

Quite irrespective of the independent tests, the testing grounds are, under special conditions, available to members

THE INSTRUMENT ROOM.

of the Section for private experiments, private investigations, etc., and research work of a private character.

As regards the loan of ground or space at the testing station for private full-size or laboratory tests of an experimental nature, a scale of charges will in due course be arranged, according to which the members of the Section will be able to avail themselves of the accommodation, instruments, etc., at moderate rates. Every encouragement and facility will be afforded to members undertaking research or experimental work.

Such tests have, however, to be conducted purely as private tests, and no report on investigations of this description may be issued by the maker, as it is of the utmost importance that the only reports issued in respect to work carried on at the Testing Station should relate to the official tests conducted under the auspices of the Committee.

REPORTS.

In respect to the Reports issued by the Committee, the only reference as to their framing that need be made is again to emphasise the fact that every possible precaution is taken in wording them to avoid any semblance of opinion or comparison. They are drafted solely as a record of facts, and are intended to be read as such.

In the case of makers' tests, the exhibitor has an opportunity given him to put any grievance before the Executive prior to the issuing of the report dealing with his individual test, and any observations on his part receive the full consideration of the Executive.

The Reports are published at the discretion of the Executive, and they are not only distributed among the members of the Committee, but among such non-members as is thought advisable, including the officials of the leading public offices.

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PUBLICATIONS OF THE
BRITISH FIRE PREVENTION COMMITTEE.—No. 60.
Edited by Edwin O. Sachs.

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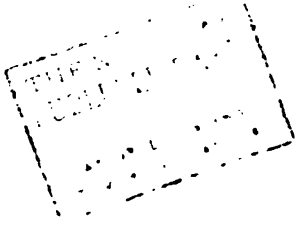
FIRE TESTS
WITH
AUTOMATIC FIRE ALARMS.

CLOSED CIRCUIT AND OPEN CIRCUIT
AUTOMATIC FIRE ALARMS
BY
THE PEARSON FIRE ALARM SYSTEM, LTD., LONDON.

THE COMMITTEE'S REPORT.

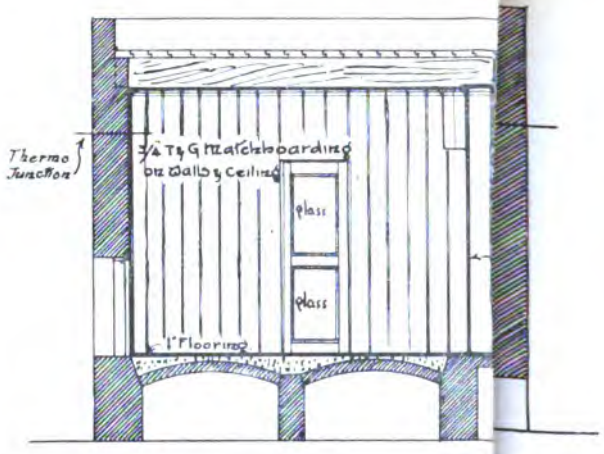
LONDON, 1902.

PUBLISHED AT THE OFFICE OF
THE BRITISH FIRE PREVENTION COMMITTEE.
(Founded 1897—Incorporated 1899)
1, WATERLOO PLACE, PALL MALL.



British

SX



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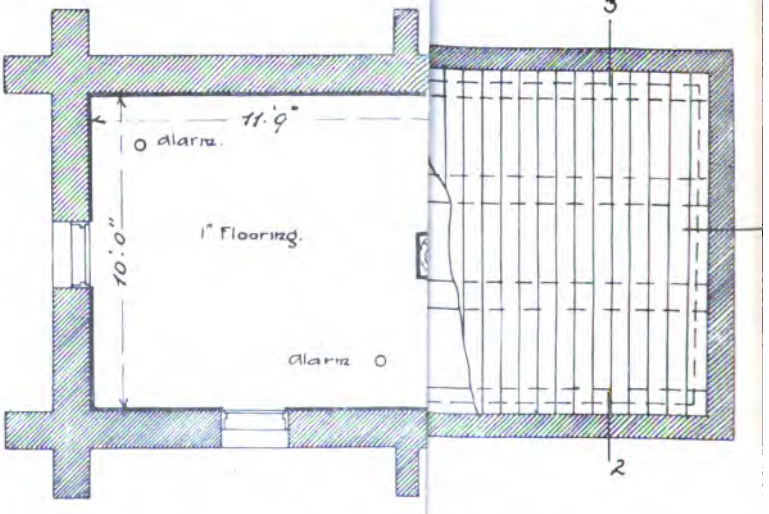

PLAN OF

CHAMBER A.

Figs.

Publications of the

BRITISH FIRE PREVENTION COMMITTEE—No. 66.

Edited by Edwin O. Sachs.

FIRE TESTS

WITH

AUTOMATIC FIRE ALARMS

CLOSED CIRCUIT AND OPEN CIRCUIT

AUTOMATIC FIRE ALARMS

BY

THE PEARSON FIRE ALARM SYSTEM, LTD., LONDON

THE COMMITTEE'S REPORT

ALL RIGHTS RESERVED

LONDON, 1902

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
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22. FIRE TESTS WITH PARTITIONS. A Lath and Plaster Partition; a Bricked Nogged Partition.
23. FIRE TESTS WITH FLOORS. A Floor by the Columbian Fireproofing Co., New York.
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25. FIRE TESTS WITH DOORS. A Wood Door covered with Tinned Steel Plates; an Iron Framed and Panelled Door.
26. FIRE TESTS WITH DOORS. A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
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42. FIRE TESTS WITH SAFES. A Safe.
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45. FIRE TESTS WITH FLOORS. A Floor and Ceiling by the Mural and Decorations Syndicate, Ltd., London.
46. FIRE TESTS WITH FIRE-RESISTING CURTAINS. Two "Screen-Sail" Curtains by Mr. Rasmus Bugge.
47. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. D. Anderson & Son, Ltd., London, and Messrs. J. C. Broadbent & Co., Ltd., London.
48. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke-Breeze Concrete.

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OBJECTS OF THE COMMITTEE:

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable

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The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

THE PEARSON FIRE ALARM SYSTEM.

The working of this system depends upon the fusion of a hard metal link, and it is claimed that the metal of which this link is made can be so constituted as to fuse at any desired temperature exceeding 140° F.

The system may be arranged in two ways, *i.e.*, either by the breaking of a closed electric circuit, or by the closing of an open circuit.

In the first case there is in circuit with the fusible device a small electric magnet holding up an armature; on the cutting off of the current by the fusion of the link, this armature falls and completes a second electric circuit, which actuates the Alarm Bells. In the second case the fusion of the link allows two pieces of metal, in connection with the electric circuit supplying current to the Alarm, to come in contact; this completes the circuit, and the alarm is given.

LIONEL J. LANGRIDGE.

November 5th, 1902.

THE GENERAL ARRANGEMENTS FOR TESTS.

(MEMORANDUM.)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Committee's present Testing Station, it comprises a house, standing in its own grounds, near Royal Oak Station, and backing on to the Great Western Railway. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

For the Executive,

EDWIN O. SACHS, *Chairman.*

OFFICIAL REPORT

OF THE

BRITISH FIRE PREVENTION COMMITTEE.

[FOUNDED 1897—INCORPORATED 1899.]

FIRE TESTS, 42, 43, and 44. JULY 30th, 1902.

Closed Circuit and Open Circuit Automatic Fire Alarms,

BY

THE PEARSON FIRE ALARM SYSTEM, LTD., LONDON.

OBJECT OF TESTS.

To ascertain at what period after a fire has been started the alarm would be given by Pearson's Fire Alarm, and the amount of damage when the fire has been extinguished by hand apparatus after a lapse of three minutes.

Note.—In each case four alarms, two of closed circuit and two of open circuit type, were fixed, each on a separate circuit, and each intended to give an alarm when subjected to a temperature of 160° Fahr.

Note.—Five thermo-junctions were fitted at various points in each hut to ascertain the maximum temperature reached before the alarm was given, four recording on an observation record, and one recording on a continuous record.

SUMMARIES OF EFFECT.

Test I. (*Chamber A*).

A fire of ten minutes duration, causing a varying temperature up to 300° Fahr., did not result in an alarm.

Note.—The damage by fire was found to be so slight, that the same chamber and furniture were re-used without alteration, for Test III.

Test II. (*Chamber B*).

The alarms sounded simultaneously within thirty seconds of the starting of the fire, and after three minutes had elapsed the fire was extinguished by hand apparatus, and small damage was done to the contents of the chamber.

Test III. (*Chamber A*).

The first alarm sounded within one minute of the starting of the fire, and after three minutes the fire was extinguished by hand apparatus, and small damage was done to the contents of the chamber.

Note.—The indicators in Test No. III. were the same as used in Test No. I.

DESCRIPTION OF TESTING PLANT.

(*See Figs.* 1 *to* 4).

The Testing Chamber was located at the Committee's Testing Station, and was known as Hut No. 2 (A & B).

The chamber was constructed, as shown, of stock bricks with lime mortar, and measured 22-ft. 3-in. by 10-ft. internally.

The hut was divided into two chambers (A & B) by $\frac{3}{4}$-in. tongued and grooved matchboarding (*see* plan).

The ceiling under the respective roofs was 8-ft. 3-in. above the flooring of the chambers.

There was one doorway to each chamber, measuring 2-ft. by 6-ft., and there was an observation opening to each chamber; the doorway had a glazed casement door, and the openings also had glazed casements.

The photographs were taken by daylight.

The stream of water was applied through a small nozzle, and supplied from an ordinary hand-pump.

Fig. 5. View of Chamber *B* before Test No. II.

Fig. 6. View of Chamber *B* after Test No. II.

Two Roberts-Austen pyrometers were used for recording temperatures, to take four observation records from points Nos. 1, 2, 3, 4, and Nos. 1', 2', 3', 4', respectively, and a continuous record was taken from points No. 5 and No. 5'.

Note.—The indicator-board and the alarm-bell were fixed in the Committee Room, and current was obtained from five dry cells.

ARRANGEMENT OF CHAMBER *A*.

The Chamber *A* was fitted up to represent as nearly as possible the interior of an office in the Manchester warehouse district; the walls and the ceiling were match-lined, and the contents consisted of a carpet, a pair of stuff curtains, and one lace curtain arranged as to a window, a table and cloth, two chairs, a box of rubbish, and a waste paper basket full of wood-rubbish, shavings, paper, etc. There were three celluloid half-balls on a shelf.

ARRANGEMENT OF CHAMBER *B*.

Chamber *B* was fitted up to represent the interior of a furnished sitting-room; the walls and ceilings were matchboarded, and the contents of the room consisted of a carpet, stuff and lace curtains, two fancy tables, a "what-not" with vase of fancy dried grass thereon, two cane-seated and one wicker easy chair, some unframed pictures, and some small decorative articles, fans and artificial flowers, and on the table was placed a glass reservoir paraffin lamp which was alight.

THE TESTS.

On July 30th the Tests were undertaken. The following is a log of the tests:—

At 3 p.m. the meteorological observations taken at the Botanic Gardens, Regent's Park read as follows:

State of weather, fair to cloudy; Wind, N.W.; Barometer, 30·13 ins.; Attached Thermometer, 64° Fahr.; Dry Bulb, 66·2° Fahr.; Wet Bulb, 56·5° Fahr.; Remarks—fine afternoon, wind slight to fresh.

Fig. 7. VIEW OF CHAMBER *A* BEFORE TEST NO. I.

Fig. 8. VIEW OF CHAMBER *A* AFTER TEST NO. III.

TEST No. I. (CHAMBER *A*).

4 p.m—A fire started by a match dropped into the waste-paper basket flared fiercely until the basket and contents were consumed, damaging table cloth in contact.

4.10 p.m.—No alarm had been given, the fire died out and the test was closed.

Note.—The damage by fire was found to be so slight, that the same chamber and furniture were re-used without alteration, for Test III.

A record of the temperatures obtained is as below:

Chamber *A*, Test No. I. Observations from Points Nos. 1, 2, 3 and 4.

Time.	No. 1.	No. 2.	No. 3.	No. 4.
4.0	140	190	200	150
4.1	170	210	300	180
4.2	180	190	200	175
4.3	150	170	180	170
4.4	145	130	145	140
4.5	130	130	140	135
4.6	120	120	130	120
4.7	110	110	110	110
4.8	100	100	100	110
4.9	90	100	110	100
4.10	90	95	95	100

Note.—No record was taken on the continuous record.

TEST No. II. (CHAMBER *B*).

4.14 p.m.—Fire started by breaking the reservoir of paraffin lamp and immediately the curtains caught alight.

4.14½ p.m.—Alarm sounded in Committee Room, all the indicators acted so quickly that it was impossible to identify them.

4.15 p.m.—A large portion of glazed upper panel of sheet-glass in the door fell inwards.

4.17½ p.m.—Three minutes having elapsed, instructions were given for the fire to be extinguished. Water applied by hand-pump and fire extinguished with a little over one pail of water.

The following temperatures were recorded :—Chamber *B.*, Test II. Observations taken at Points Nos. 1', 2', 3', 4'.

Time.	No. 1'.	No. 2'.	No. 3'.	No. 4'.
4.14	200	—	—	—

Note.—No further readings could be taken, as within a further ten seconds the reading was above 300° Fahr.

OBSERVATION AFTER TEST No. II.

The damage by fire was found to be slight; the table was slightly burned; the table-cover and carpet were burned for about one yard super; the fans and light ornaments on the walls were consumed, and the match-linings were slightly charred locally; the curtains were consumed.

TEST No. III. (CHAMBER *A*).

4.40 p.m.—Fire started by a match being dropped into an old wine-case filled with waste-paper and other light *debris* which was close to the curtains.

4.40½ p.m.—Window curtains caught fire.

4.41 p.m.—Closed circuit indicator at the back of the hut gave the alarm in Committee Room.

4.42½ p.m.—Open circuit indicator at the back of the hut gave the alarm in Committee Room.

4.43 p.m.—Closed circuit indicator at the front of the hut gave the alarm in Committee Room.

Three minutes having elapsed after first alarm instructions were given for the fire to be extinguished. Water applied by hand-pump and fire extinguished. One pail of water was used.

The following temperatures were recorded :—Chamber *A*, Test III. Observations from Points Nos. 1, 2, 3, and 4.

Time.	No. 1.	No. 2.	No. 3.	No. 4
4.40	140	200	—	—

Note.—No further readings could be taken as within a few seconds the reading was above 300° Fahr.

Note.—No record was taken from the continuous record.

OBSERVATIONS AFTER TEST No. III.

The damage caused by the fire was slight.

The box containing waste, in which the fire was started, was charred on the inside, not consumed; the curtains were destroyed; carpet burnt near spot where the fire started; table practically uninjured except for slight scorching, and one end of table-cover only burnt. The seat of the chair near where fire commenced was burnt and the frame was scorched. Celluloid half-balls on the shelf collapsed with the heat, but did not ignite. The match-board lining to the wall was slightly charred at the position where the curtains were fixed.

GENERAL ARRANGEMENTS.

The Test was carried out according to the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive, comprising—

Mr. Lionel J. Langridge, A.Inst.E.E.
Mr. F. W. Hamilton, A.R.I.B.A.
Mr. F. Hammond, F.R.I.B.A.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.Inst.E.E. superintended in the Instrument Room.

The Executive was represented by—

Mr. Edwin O. Sachs (Chairman).
Mr. Max Clarke, A.R.I.B.A.
Mr. Ellis Marsland, District Surveyor, Camberwell.
Mr. James Sheppard (North British and Mercantile Insurance Co.)

The general body of members was represented by—

Mr. T. Dyson, Chief Officer, Fire Brigade, Windsor—Mr. Horace Folker, Hon. Gen. Sec., N.F.B.U.—Mr. William

Grellier, F.R.I.B.A., District Surveyor, Clapham—Mr. Thomas Leach, Chief Officer, Wimbledon Fire Brigade—Mr. James Norrington, A.M.Inst.C.E.—Mr. H. Brome Tarry.

The Commercial Section was represented by—

Mr. F. R. Farrow, F.R.I.B.A. (Chairman)—Mr. G. Davenport (Davenport & Coward) — Mr. S. Cordwell (D. H. Evans & Co., Ltd.)—Mr. Frederick Jones and Mr. Eustace Palmer (Huntley & Palmer).

Messrs. Pearson's Fire Alarm System Ltd., was represented by—

Mr. H. G. Barrett, Mr. Geo. B. Bowell, Mr. A. McNeil and Mr. Richard Pearson.

The following visitors attended by special invitation of the Executive—

Mr. Gregory Collins (L.C.C.)—Major C. J. Fox, (London Salvage Corps)—Mr. J. R. Gall (General Manager, National Telephone Co.)—Mr. J. Hills Hartridge—Mr. W. Holmes—Mr. J. Leonard—Mr. G. Lewis—Mr. A. Poncerot, Mr. C. Smith and Mr. F. Walker.

Signed,

For the Sub-Committee conducting the Test:
LIONEL LANGDRIDGE.

For the Commercial Section:
FREDERIC R. FARROW.

For the Executive:
EDWIN O. SACHS.

Published by the Committee as directed by the Executive.

EVAN CAMPBELL
(Secretary).

Date—November 5th, 1902.

Verified a true copy of the Report ordered to be published.

WILLIAMSON, HILL & CO.
(Solicitors).

Date—November, 15th, 1902.

PUBLICATIONS of the BRITISH FIRE PREVENTION COMMITTEE

(*Continued from Second Page of this Publication*).

49. FIRE TESTS WITH DOORS. A 2¼-in. Door of Archangel Deal constructed in three Thicknesses; a 2¼-in. Door of Quebec Pine constructed in Three Thicknesses. Particulars of Experimental Fire Tests.
50. FIRE TESTS WITH DOORS. A 2¼-in. Door of Archangel Deal constructed in Three Thicknesses; a 1¾-in. Door of Teak, Flush Panelling on each side, the Panels being in Two Thicknesses. Particulars of Experimental Fire Tests.
51. FIRE TESTS WITH FIRE RESISTING CURTAINS. Two Fire Blinds, known as the "Williams" Fire Blinds, Installed by G. A. Williams & Son, Bayswater, London. The Committee's Report.
52. FIRE TESTS WITH PARTITIONS. A Partition formed with "Mack" Patent Slabs, and erected by M. J. A. King & Co., London. The Committee's Report.
53. FIRE TESTS WITH PARTITIONS. A Partition known as the "Cunnah-Wright" Partition, by the Fireproof Partition Syndicate, Ltd., London. The Committee's Report.
54. FIRE TESTS WITH DOORS. A 2¾-in. Door of Oak constructed in Three Thicknesses; a 2¾-in. Door of Teak constructed in Three Thicknesses. Particulars of Experimental Fire Tests.
55. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke Breeze Concrete with Expanded Metal and Plaster Ceiling. Particulars of Experimental Fire Tests.
56. FIRE TESTS WITH FLOORS. A Floor by the Mural and Decorations Syndicate, Ltd., London, being a Double Test. The Committee's Report.
57. FIRE TESTS WITH TREATED WOOD. A Match-boarded Partition of Deal painted with Oil-colour; a Match-boarded Partition of "Non-Flammable" Deal painted with "Non-Flammable" Paint by the London Non-Flammable Wood Company, Ltd., London. The Committee's Report.
58. FIRE TESTS WITH PARTITIONS. A Partition known as the "Cunnah-Wright" Partition, by the Fireproof Partition Syndicate, Ltd., London. The Committee's Report.
59. FIRE TESTS WITH DOORS. An ordinary 4-Panelled Deal Door; an ordinary Ledged Deal Door. Particulars of Experimental Fire Tests.
60. FIRE TESTS WITH DOORS. Two Iron Doors. Particulars of Experimental Fire Tests.
61. FIRE TESTS WITH FLOORS. A Floor of Steel Joists with Coke Breeze Concrete. Particulars of Experimental Fire Tests.
62. FIRE TESTS WITH CEILINGS. A Wood Floor and Ceiling protected by an Additional Suspended Ceiling by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.
63. FIRE TESTS WITH PARTITIONS. A Partition erected by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.
64. FIRE TESTS WITH FLOORS. A Floor by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.
65. The Testing Arrangements of the British Fire Prevention Committee. Some Notes with Illustrations. By ELLIS MARSLAND.
66. FIRE TESTS WITH AUTOMATIC FIRE ALARMS. Closed Circuit and Open Circuit Automatic Fire Alarms, by Pearson's Fire Alarm System, Ltd., London. The Committee's Report.
67. FIRE TESTS WITH DOORS. A Door composed of Deal and Uralite covered externally with Tinned Steel; a Door composed of Deal and Uralite covered externally with Uralite, by the British Uralite Co., Ltd., London. The Committee's Report.
68. FIRE TESTS WITH DOORS. A 1¾-in. Framed "Jarrah" Door, with 1¼-in. Solid Panels; a 1¾-in. Framed "Karri" Door, with 1¼-in. Solid Panels, by Messrs. Millars' Karri and Jarrah Forests, Ltd., London. The Committee's Report.
69. FIRE TESTS WITH DOORS. Two 2-in Doors of Deal, hung in one opening, with a space between the Doors; two 2-in. Doors of Oak, hung in one opening, with a space between the Doors. Particulars of Experimental Fire Tests.
70. FIRE TESTS WITH DOORS. A 2-in. "Jarrah" Four-Panel Bead Flush Both Sides Door; a 2-in. "Karri" Four-Panel Bead Flush Both Sides Door, by Messrs. Millars' Karri and Jarrah Forests, Ltd., London. The Committee's Report.
71. FIRE TESTS WITH FLOORS. A Floor, by Messrs. Millars' Karri and Jarrah Forests, Ltd., London. The Committee's Report.
72. FIRE TESTS WITH ROOFS. A Slated Roof and Ceiling; a Flat Roof covered with Vulcanite Roofing and Ceiling, by the Vulcanite, Ltd., London and Belfast. The Committee's Report.

268192

PUBLICATIONS OF THE
BRITISH FIRE PREVENTION COMMITTEE.—No. 87.

Edited by Edwin O. Sachs.

FIRE TESTS WITH DOORS

A DOOR COMPOSED OF DEAL AND URALITE

Covered externally (i.e. "armoured") with Tinned Steel.

A DOOR COMPOSED OF DEAL AND URALITE

Covered externally with the Latter.

BY

THE BRITISH URALITE COMPANY, LTD.

LONDON AND HIGHAM

The Committee's Report

LONDON, 1905

PUBLISHED BY THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(Affiliated 1897—Incorporated 1899)
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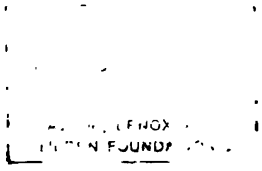
ASTOR, LENOX
TILDEN FOUNDA

VIEWS

FIG. 1. AFTER 35 MINUTES.

FIG. 2

FIG. 5. AFTER 55 MINUTES.

FIG. 6

FIG. 9. AFTER 75 MINUTES.

FIG. 10

'ispiece]

VIEWS

the
TISH FIRE PREVENTION COMMITTEE—No. 67

win O. Sachs

E TESTS WITH DOORS

DOOR COMPOSED OF DEAL AND URALITE

RED EXTERNALLY (*i.e.* "ARMOURED") WITH TINNED STEEL.

FIG 2

DOOR COMPOSED OF DEAL AND URALITE

COVERED EXTERNALLY WITH THE LATTER.

BY

HE BRITISH URALITE COMPANY, LTD.

LONDON AND HIGHAM

C.E

The Committee's Report

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[*Continued on p.* 23

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OBJECTS OF THE COMMITTEE:

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

NOTE.

IT has occurred to me that many may not know exactly what "Uralite" is, and that the most useful note I could write is a brief description of the material.

"Uralite consists of asbestos fibres, which are separated so that they may cross and interlace, and with them a small quantity of chalk is mixed. This mass, in the form of a pulp, is spread out into sheets by means of board-making machines. During the spreading out, materials are added which cause the conformation of gelatinous silica. The board is then dried, and is repeatedly treated with chemicals to cause the deposition of silica within its pores.

"After each deposition it is dried and heated so as to cause actual silica to be generated within it, and the chemicals resulting from the change consist practically of common carbonate of soda, and are washed out. The result is the hard board known as Uralite, which, however, possesses the property of being cut and worked by ordinary carpenter's tools."

I am indebted to the Company for the above technical description of the process and result. The boards are about 1/8 inch thick, the largest size at present made is 6 feet by 3 feet.

MAX CLARKE.

LONDON,
September, 1902.

THE GENERAL ARRANGEMENTS FOR TESTS.

(MEMORANDUM.)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Committee's present Testing Station, it comprises a house, standing in its own grounds, near Royal Oak Station, and backing on to the Great Western Railway. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.* not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

For the Executive,

EDWIN O. SACHS, *Chairman.*

OFFICIAL REPORT

OF THE

BRITISH FIRE PREVENTION COMMITTEE.

[FOUNDED 1897—INCORPORATED 1899.]

FIRE TESTS NOS. 40 AND 41. JULY 9TH, 1902.

A Door composed of Deal and Uralite, covered externally (or armoured) with Tinned Steel.

A Door composed of Deal and Uralite, covered externally with the latter.

(Simultaneous Tests.)

OBJECT OF TEST.

To record the effect of a fire of one-and-a-half hours' duration, gradually increasing to a temperature of 2000° Fahr.

Note.—The fire was to be applied from one side, and the doors were to open outwards away from the fire.

Note.—The door openings were to be approximately 2 ft. 9 in. by 6 ft. 6 in.

SUMMARY OF EFFECT.

THE URALITE COVERED DOOR.

In 40 minutes a spurt of flame appeared on the north side at the joint between door and frame, about the centre of the height; it was about 8 in. long, and lasted for a short time and then ceased.

Quantities of vapour or smoke came through the joints between door and frame throughout the test.

At the conclusion of the test, viz. 90 minutes, the door and frame remained in position, and the external surface was not damaged ; the door was slightly buckled.

THE URALITE AND STEEL COVERED DOOR.

In 40 minutes a spurt of flame appeared at the joint between door and head of frame; it lasted for a short time and then ceased.

Vapour or smoke came through the joints between door and frame throughout the test.

At the conclusion of the test, viz. 90 minutes, the door and frame remained in position; the former was slightly buckled.

The plates on the outside of the door were not damaged, but those on the inside of the door were bulged towards the fire and the joints slightly opened.

DESCRIPTION OF THE TESTING PLANT.

(*See Figs.* A, B, C, D.)

The Testing Chamber used was located at the Committee's Testing Station, and was known as No. 3 Hut.

The Hut was constructed, as shown, of stock bricks, with lime mortar, and measured 10 ft. by 10 ft. internally.

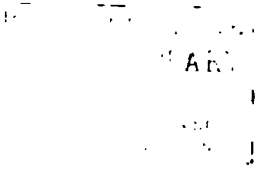
The ceiling of the hut was 9 ft. above the pavement of the chamber, and was formed of concrete.

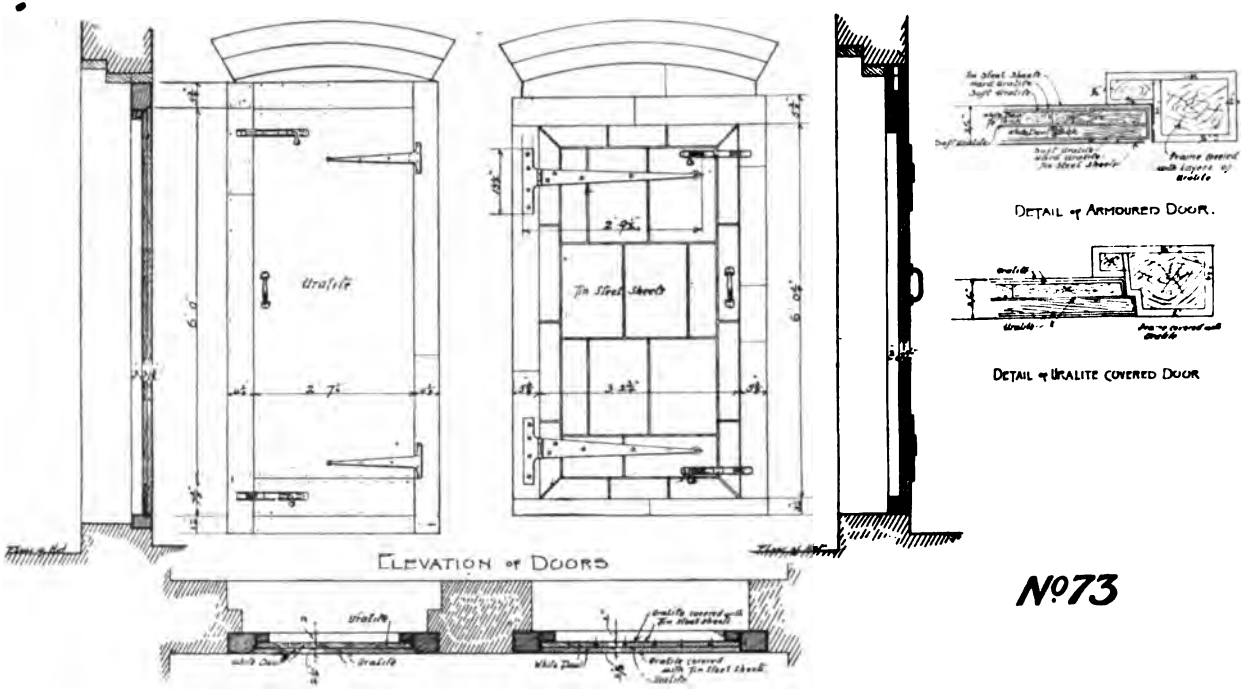
The fuel used was gas produced at the Station, and the supply was regulated by valves and dampers.

The gas was admitted through two mixing chambers of fire-brick, as shown.

Two Roberts-Austen pyrometers were used for recording temperatures, to take four observation records from points Nos. 1, 2, 3, 4, and one automatic record from point No. 5. Points Nos. 1 and 4 were outside the doors, and the others on the fire side of doors. (See Roof Plan.)

There were observation holes in the north and south walls, closed by movable iron shutters.





DETAIL of ARMOURED DOOR.

DETAIL of URALITE COVERED DOOR

No73

Figs. E, F. DETAILS OF THE DOORS.

A 5

The draught holes were in the north and south walls.

The photographs were taken by daylight and flashlight.

A brick wall, 14 in. thick, with two openings in it was built across the hut, running from east to west. It was built 13 in. back from the main wall. The two openings were arched over with brick arches in two half-brick rings. The wall was built with gauged stuff.

The Uralite Covered Door.

The finished size of the door was 2 ft. $7\frac{1}{2}$ in. by 6 ft. $7\frac{3}{8}$ in., and $2\frac{1}{4}$ in. thick.

It was constructed of two thicknesses of white deal, each $\frac{7}{8}$ in. thick, secured together with 2-in. wire brads, one set of boards being vertical and the other horizontal, each $\frac{7}{8}$ in. thick, with one layer of soft Uralite between the boarding, and one layer of soft and one layer of hard Uralite on the outside faces and edges, secured with wire clout nails. The sides and head of the door were double rebated, as shown in Fig. E.

The frame was 5 in. by 4 in., with a single rebate worked on it, covered with six thicknesses of hard Uralite all round, and having a fillet $1\frac{1}{2}$ in. by $1\frac{3}{8}$ in. nailed on to form the second rebate; the Uralite going all round the frame and rebate, and also between the wood frame and the fillet forming the second rebate. The total lap of both rebates amounted to 3 in.

The sill was of the same material as the frame, but without any rebate, covered all round with hard Uralite as the frame.

The door fitted very closely into the frame. The frame was wedged into the brick opening and pointed up with lime mortar.

The door was hung with two stout cross garnett hinges, each 18 in. long, screwed on and fitted with two barrel bolts and an iron handle, all as shown in Figs. E and F.

The Uralite and Steel Covered Door.

The finished size of the door was 3 ft. $2\frac{3}{4}$ in. by 6 ft. $0\frac{3}{4}$ in., and $2\frac{1}{2}$ in. thick.

It was constructed with two thicknesses of white deal, tongued and grooved and fixed together with 2-in. wire brads, one set of boards being vertical and one horizontal, each $\frac{7}{8}$ in. thick, with one layer of soft Uralite between the boarding, and one layer of hard and one of soft Uralite on the outside faces and edges; the tinned steel sheets (0·022 thick) were then put on with folded joints and secured to the door with $2\frac{1}{4}$-in. drive screws, the position of the joints being indicated in Figs. E and F.

The frame was 4 in. by 5 in., covered with six thicknesses of hard Uralite all round, and having a fillet 2 in. by $1\frac{1}{2}$ in. nailed on to form the rebate, the Uralite going all round the frame and rebate and also between the wood frame and fillet forming the rebate.

The sill was of the same material and size as the frame, but without any rebate, covered all round with hard Uralite as the frame, it being slightly splayed on the top to allow the door to shut close.

The door fitted into the frame very closely for a door of this description.

The frame was wedged to the brick opening and pointed up on both sides with lime mortar.

The door was hung with two stout cross garnett hinges, each 2 ft. $9\frac{1}{2}$ in. long screwed on, and fitted with two barrel bolts and an iron handle, all as shown in Figs. E and F.

The space between the head of the frame and the soffit of the brick arch was filled in with two pieces of deal with the upper edges curved, covered with two layers of hard Uralite and a layer of soft Uralite between, glued on to the faces and edges, as shown in Fig. E.

THE TEST.

(*See Figs.* G *and* H.)

The test was undertaken on July 9th 1902. The following is a log of the test :—

At 3 p.m. the meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows :

State of weather, fair; Wind, W.S.W.; Barometer, 29·86 inches; Attached Thermometer, 71° Fahr.; Dry Bulb, 71·2° Fahr.; Wet Bulb, 64° Fahr.; Remarks, fair, brisk wind.

The following temperature observations were taken during the test from points Nos. 1, 2, 3 and 4 :

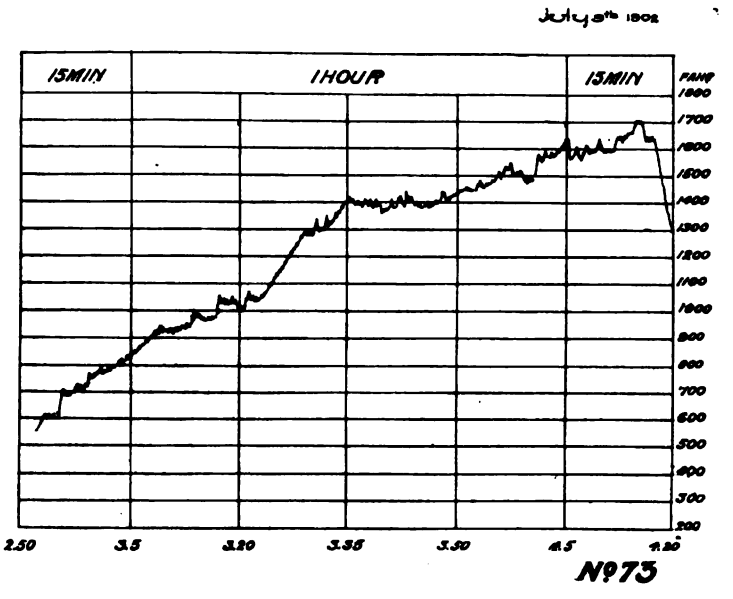
Time.	Inside.		Outside.	
	No. 2.	No. 3.	No. 1.	No. 4.
P.M.	Deg. Fahr.	Deg. Fahr.		
2.48	500	500		
2.55	750	740		
3.0	880	880		
3.5	980	980		
3.10	1040	1020		
3.15	1040	1040		
3.20	1120	1120		
3.25	1360	1340		
3.30	1480	1440		
3.35	1500	1490		
3.40	1530	1510		
3.45	1560	1540		
3.50	1580	1560		
3.55	1620	1580		
4.0	1620	1600		
4.5	1720	1680		
4.10	1780	1760		
4.15	Gas turned off.			
4.15	1400	1400		

Note.—There was no record from the points Nos. 1 and 4 outside the doors, the temperature not having reached a sufficient height.

Fig. G. VIEW OF DOORS BEFORE TEST.

Fig. II. VIEW OF DOORS AFTER 50 MINUTES.

The following diagram shows the continuous record from point No. 5 :—



The following observations were made during the test :—

OBSERVATIONS ON THE OUTSIDE.

Time.	URALITE COVERED DOOR.	Minutes elapsed.	URALITE AND STEEL COVERED DOOR.
p.m. 2.45	The gas was lighted.	...	The gas was lighted.
3.0	Slight vapour or smoke coming through joint between door and frame about top bolt.	15	Slight vapour or smoke coming through joint all along between top of door and head of frame.

OBSERVATIONS ON THE OUTSIDE—*continued.*

Time.	URALITE COVERED DOOR.	Minutes elapsed.	URALITE AND STEEL COVERED DOOR.
p.m.			
3.5	Cracking noise coming from door.	20	Door too hot all along the top to hold the hand against it.
3.20		35	Door buckling slightly outwards about the centre.
3.25	A flash of flame appeared on the north side at the joint between door and frame, about the centre of the height; it was about 8 in. long and lasted for a few seconds and then ceased.	40	A flash of flame appeared at the joint between door and head of frame; it lasted for a few seconds and then ceased.
3.45	Large quantities of vapour or smoke coming through joint almost all round door.	60	
4.15	The gas was shut off and water applied on the outside of door.	90	The gas was shut off and water applied on the outside of door.
4.18	Water applied on the inside of door. Test closed.	93	Water applied on the inside of door. Test closed.

Observations on the Inside.

Note.—The flames were nearer to the steel-covered door than to the Uralite door.

Time.	Uralite Covered Door.	Minutes elapsed.	Uralite and Steel Covered Door.
p.m.			
3.20	Joint along the sill opening.	35	Plates bulging towards the fire.
3.25	Flames coming through several of the joints of the Uralite of door and frame.	40	
3.30		45	Flames coming through many of the joints of the steel plates.

Observations after the Test

(*See Figs.* I *to* O.)

Soon after the test both doors were opened.

The Uralite Covered Door.

The door was buckled $\frac{3}{4}$ in. outwards between the bolts, and slightly less than that between the hinges. The outer thickness of Uralite was not damaged.

The Uralite and Steel Covered Door.

The door was buckled $\frac{3}{8}$ in. outwards between the bolts, and slightly less than that between the hinges. The plates on the outside were not damaged.

Fig. I. VIEW OF DOORS AFTER 90 MINUTES.

VIEW OF DOORS AFTER TEST.

VIEW OF INSIDE OF ARMOURED DOOR AFTER TEST.

VIEW OF INSIDE OF URALITE DOOR AFTER TEST.

Figs. K, L, M. VIEWS AFTER CONCLUSION OF TEST.

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OBSERVATION AFTER THE TEST—*continued.*

The Uralite Covered Door.	*The Uralite and Steel Covered Door.*
The upper portion of the inside layers of Uralite were broken away (being carried away on the application of water). The inner thickness of wood was carbonised throughout; the centre layer of Uralite was cracked and damaged. The outer thickness of wood was partly carbonised.	The plates on the inside were all in position, but were all much bulged towards the fire and the joints slightly opened. Upon removing one of the steel plates it was found that the inner thickness of boarding was carbonised; the centre thickness of Uralite was not damaged, the outer thickness of boarding was discoloured but not much damaged.

GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive, comprising—

Mr. Max Clarke, A.R.I.B.A. (Directing Member).
Mr. F. Hammond, F.R.I.B.A.
Mr. J. Sheppard (North British and Mercantile Ins. Co.).

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.Inst.E.E., superintended in the Instrument Room.

The Executive was represented by—

Mr. Edwin O. Sachs (Chairman).
Mr. F. R. Farrow, F.R.I.B.A.
Mr. Lionel J. Langridge, Assoc.Inst.E.E.
Mr. Ellis Marsland, District Surveyor, Camberwell.

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The general body of Members was represented by—

Mr. D. H. Barry—Mr. H. Busbridge, M.S.I.—Mr. S. Flin Clarkson, F.R.I.B.A., District Surveyor, Chelsea—Mr. T. Dyson, Chief Officer, Fire Brigade, Windsor—Mr. E. J. A. Folker, Hon. Sec. National Fire Brigades' Union—Mr. E. R. Hewitt, A.R.I.B.A., District Surveyor, St. Saviour's, Southwark—Mr. Owen D. Lucas—Mr. Robert Notley, F.R.I.B.A., District Surveyor, Bethnal Green—Mr. Henry Ough, A.M.Inst.C.E. — Mr. L. Pyke, A.M.Inst.C.E., M.I.E.E. —Mr. Thomas Wilkins, F.G.S.—Mr. Oswald C. Wylson, F.R.I.B.A.

The Commercial Section was represented by—

Mr. F. R. Farrow, F.R.I.B.A. (Chairman)—Mr. A. E. Bithrey (The Ratner Safe Co.)—Mr. B. R. Ikin (Messrs. J. Robinson & Son)—Mr. W. H. James (Messrs. G. A. Williams & Sons)—Lieut.-Col. J. H. Sankey—Mr. C. H. Sankey (Messrs. Sankey & Son)—Mr. F. Wallers (Messrs. Dowson, Taylor & Co.).

The British Uralite Company, Limited, was represented by—Mr. H. Armstrong, Mr. R. J. Friswell, Mr. R. L. McLaren, Mr. F. B. Passmore, Mr. John Young and Mr. S. J. Zechini.

The following visitors attended by special invitation of the Executive:

Mr. J. H. Beckett (Railway Clearing House); Mr. C. MacArthur Butler (Society of Architects); Mr. J. Christie; Mr. R. O. Davies; Mr. C. H. Dabble (Messrs. Mather & Platt); Count Emo; Mr. R. Fabian (Northern Insurance Co.); Major Hemming (War Office); Captain Hodgkinson (British India Steam Navigation Co.); Mr. G. S. Hoffmann; Mr. F. Izant (Phœnix Fire Office); Mr. R. Philips (Clerk

of Works, Law Courts); Mr. R. Shawcross; Mr. James Shipp (Messrs. Spencer Turner & Co.); Mr. H. A. Spalding (for Director of Navy Contracts); Mr. G. Stubbings (Great Eastern Railway Fire Brigade); and Mr. George Trotman.

Signed,

For the Sub-Committee conducting the Test:
MAX CLARKE.

For the Commercial Section:
FREDERIC R. FARROW.

For the Executive:
EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.

EVAN CAMPBELL
(*Secretary*).

Date—September 24th, 1902.

Verified a true copy of the Report ordered to be published.

WILLIAMSON, HILL & CO.
(*Solicitors*).

Date—October 1st, 1902.

PUBLICATIONS of the BRITISH FIRE PREVENTION COMMITTEE

(*Continued from Second Page of this Publication*).

49. FIRE TESTS WITH DOORS. A 2¼-inch Door of Archangel Deal constructed in Three Thicknesses; a 2¼-inch Door of Quebec Pine constructed in Three Thicknesses. Particulars of Experimental Fire Tests.

50. FIRE TESTS WITH DOORS. A 2¾-inch Door of Archangel Deal constructed in Three Thicknesses; a 1¾-inch Door of Teak, Flush Panelling on each side, the Panels being in Two Thicknesses. Particulars of Experimental Fire Tests.

51. FIRE TESTS WITH FIRE RESISTING CURTAINS. Two Fire Blinds, known as the "Williams" Fire Blinds, installed by G. A. Williams & Son, Bayswater, London. The Committee's Report.

52. FIRE TESTS WITH PARTITIONS. A Partition formed with "Mack" Patent Slabs, and erected by M. J. A. King & Co., London. The Committee's Report.

53. FIRE TESTS WITH PARTITIONS. A Partition known as the "Cunnah-Wright" Partition, by the Fireproof Partition Syndicate, Ltd., London. The Committee's Report.

54. FIRE TESTS WITH DOORS. A 2¾-inch Door of Oak constructed in Three Thicknesses; a 2¾-inch Door of Teak constructed in Three Thicknesses. Particulars of Experimental Fire Tests.

55. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke Breeze Concrete with Expanded Metal and Plaster Ceiling. Particulars of Experimental Fire Tests.

56. FIRE TESTS WITH FLOORS. A Floor by the Mural and Decorations Syndicate, Ltd., London, being a Double Test. The Committee's Report.

57. FIRE TESTS WITH TREATED WOOD. A Match-boarded Partition of Deal painted with Oil-colour; a Match-boarded Partition of "Non-Flammable" Deal painted with "Non-Flammable" Paint by the London Non-Flammable Wood Company, Ltd., London. The Committee's Report.

58. FIRE TESTS WITH PARTITIONS. A Partition known as the "Cunnah-Wright" Partition, by the Fireproof Partition Syndicate, Ltd., London. The Committee's Report.

59. FIRE TESTS WITH DOORS. An ordinary 4-Panelled Deal Door; an ordinary Ledged Deal Door. Particulars of Experimental Fire Tests.

60. FIRE TESTS WITH DOORS. Two Iron Doors. Particulars of Experimental Fire Tests.

61. FIRE TESTS WITH FLOORS. A Floor of Steel Joists with Coke Breeze Concrete. Particulars of Experimental Fire Tests.

62. FIRE TESTS WITH CEILINGS. A Wood Floor and Ceiling protected by an Additional Suspended Ceiling by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.

63. FIRE TESTS WITH PARTITIONS. A Partition erected by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.

64. FIRE TESTS WITH FLOORS. A Floor by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.

65. The Testing Arrangements of the British Fire Prevention Committee. Some Notes with Illustrations. By ELLIS MARSLAND.

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GREAT WINDMILL STREET, W., AND DUKE STREET, STAMFORD STREET, S.E.

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PUBLICATIONS OF THE
BRITISH FIRE PREVENTION COMMITTEE.—No. 68.
Edited by Edwin O. Sachs.

Fire Tests with Doors

A 1¾-in. FRAMED "JARRAH" DOOR WITH 1¾-in. SOLID PANELS

A 1¾-in. FRAMED "KARRI" DOOR WITH 1¾-in. SOLID PANELS

The Committee's Report

LONDON, 1902

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(*Founded 1897—Incorporated 1899*)
1 WATERLOO PLACE, PALL MALL

34

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ALL RIGHTS RESERVED.

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17. THE TALL BUILDING UNDER TEST OF FIRE. A Paper, with Illustrations. By H. de B. PARSONS.
18. FIRE TESTS WITH FLOORS. A Floor of Solid Wood Beams.
19. FIRE TESTS WITH CEILINGS. A Ceiling by the Asbestos and Asbestic Co.
20. FIRE TESTS WITH GLASS. Three Casements by the British Luxfer Prism Syndicate.
21. FIRE TESTS WITH FLOORS. A Floor of Steel Joists, filled in with Concrete on Corrugated Iron, with a Suspended Ceiling.
22. FIRE TESTS WITH PARTITIONS. A Lath and Plaster Partition; a Bricked Nogged Partition.
23. FIRE TESTS WITH FLOORS. A Floor by the Columbian Fireproofing Co., New York.
24. FIRE TESTS WITH DOORS. A 2-in. Solid-framed Teak Door; a 1-in. Four-panel Pine Door; a 1-in. Four-panel Pine Door.
25. FIRE TESTS WITH DOORS. A Wood Door covered with Tinned Steel Plates; an Iron Framed and Panelled Door.
26. FIRE TESTS WITH DOORS. A 2-in. Framed Oak Door, with 2-in. Solid Panels; a 2-in. Framed Teak Door, with 2-in. Solid Panels.
27. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
28. FIRE TESTS WITH CEILINGS. A Ceiling of Silicate Cotton (Slag Wool) by Messrs. T. Anderson & Son, and Messrs. T. Broadbent & Co.
29. FIRE TESTS WITH GLASS. Three Casements glazed by the British Luxfer Prism Syndicate, Ltd.
30. FIRE TESTS WITH GLASS. Five Skylights glazed by the British Luxfer Prism Syndicate, Ltd.
31. FIRE TESTS WITH GLASS. Three Casements glazed with Wired Glass by Messrs. Pilkington, Bros.
32. FIRE TESTS WITH GLASS. Two Skylights glazed with Wired Glass by Messrs. Pilkington, Bros.
33. FIRE TESTS WITH GLASS. A Casement glazed with ¼-in. Plate Glass; a Casement glazed with 32 oz. Sheet Glass; a Casement glazed with "Lead Lights."
34. FIRE TESTS WITH FLOORS. A Floor of Steel Joists with Coke Breeze Concrete.
35. FIRE TESTS WITH DOORS. A 2-in. Framed Pitch Pine Door with 2-in. Solid Panels; a 2-in. Framed Deal Door with 2-in. Solid Panels.
36. FIRE TESTS WITH TREATED WOOD. "Non-Flammable" Wood by the British Non-Flammable Wood Company, Ltd., London.
37. FIRE TESTS WITH PARTITIONS. A Partition erected by the "Gypsine" Brick Company, Ltd., London and Paris.
38. FIRE TESTS WITH FLOORS. A Floor by the "Gypsine" Brick Co., Ltd., London and Paris.
39. FIRE TESTS WITH DOORS. A 2-in. Framed Honduras Mahogany Door with 2-in. Solid Panels; a 2-in. Framed Poplar Door with 2-in. Solid Panels.
40. FIRE TESTS WITH DOORS. A 2-in. Framed Austrian Oak Door with 2-inch Solid Panels; a 2-in. Framed American Walnut Door with 2-in. Solid Panels.
41. THE SAFETY OF THEATRE AUDIENCES AND THE STAGE PERSONNEL AGAINST DANGER FROM FIRE AND PANIC. A Paper. By WM. PAUL GERHARD.
42. FIRE TESTS WITH SAFES. A Safe.
43. FIRE TESTS WITH PROTECTIVE COVERINGS. Girder Coverings by the "Gypsine" Brick Company, Ltd., London and Paris.
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45. FIRE TESTS WITH FLOORS. A Floor and Ceiling by the Mural and Decorations Syndicate, Ltd., London.
46. FIRE TESTS WITH FIRE-RESISTING CURTAINS. Two "Screen-Sail" Curtains by Mr. Rasmus Bugge.
47. FIRE TESTS WITH PARTITIONS. A Match-boarded Partition filled in with Silicate Cotton (Slag Wool) by Messrs. D. Anderson & Son, Ltd., London, and Messrs. J. C. Broadbent & Co., Ltd., London.
48. FIRE TESTS WITH FLOORS. A Floor o Deal Joists and Coke-Breeze Concrete.

[*Continued on p.* 23.

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OBJECTS OF THE COMMITTEE:

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

NOTE.

THIS publication contains some interesting results of two Fire Tests with a Jarrah and Karri door respectively.

It would be well to compare the results with the results shown in earlier reports on similar doors constructed of other woods.

The Committee have undertaken two further tests with doors of Jarrah and Karri wood, which will be reported upon in publication No. 70.

EDWIN O. SACHS.

March 12, 1902.

THE GENERAL ARRANGEMENTS FOR TESTS.

(MEMORANDUM.)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Committee's present Testing Station, it comprises a house, standing in its own grounds, near Royal Oak Station, and backing on to the Great Western Railway. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.*, not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

For the Executive,

EDWIN O. SACHS, *Chairman.*

OFFICIAL REPORTS

OF THE

BRITISH FIRE PREVENTION COMMITTEE

[FOUNDED 1897—INCORPORATED 1899.]

FIRE TESTS, 33 and 34. DECEMBER 4TH, 1901.

A 1¾-in. framed Jarrah Wood Door with 1¾-in. Solid Panels.

A 1¾-in. framed Karri Wood Door with 1¾-in. Solid Panels.

OBJECT OF TEST.

To record the effect of a fierce fire of one hour, gradually increasing to a temperature of 2000° Fahr.

Note.—The fire was to be applied from one side, and the doors were to open inwards on the fire side.

Note.—The door openings were to be approximately 3 ft. 0 in. by 6 ft. 9 in.

SUMMARY OF EFFECT.

JARRAH DOOR.

In 1 minute smoke came through the joint between the top of door and frame, and also through the joints between the panels and styles.

In 16 minutes flame appeared over the top of door.

In 48 minutes the top rail was alight all along the top.

In 57 minutes flame was extending downwards through the joints between the styles and the upper portion of the frame.

In 58 minutes some small holes were burnt through the door about the centre rail.

KARRI DOOR.

In 1 minute smoke came through the joint between the top of door and frame, and also through the joints between the panels and styles.

In 13 minutes flame appeared over the top of door.

In 48 minutes the top rail was alight all along the top.

In 53 minutes some small holes were burnt through the door about centre and bottom rails.

In 57 minutes flame was extending downwards through the joints between the styles and the upper portion of frame.

DESCRIPTION OF TESTING PLANT.

(*See Figs.* A, B, C *and* D).

The Testing Chamber used was located at the Committee's Testing Station.

The chamber was constructed, as shown, of stock bricks with lime mortar, and measured 10 ft. by 10 ft. internally. The ceiling of the hut was 8 ft. 6 in. above the pavement of the chamber, and was formed of solid wood beams grouted with fire-clay.

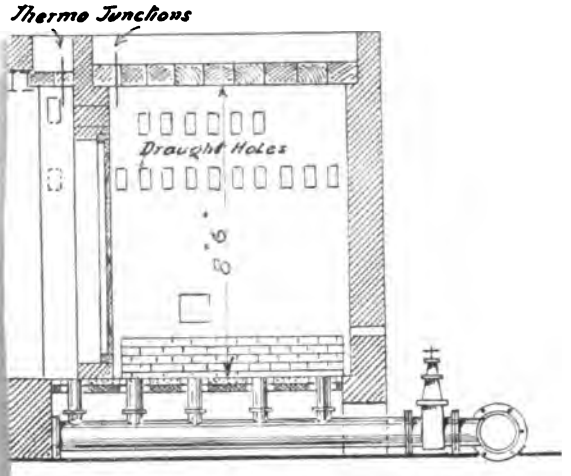
The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

The gas was admitted through two mixing chambers of fire-brick, as shown.

Two Roberts-Austen pyrometers were used for recording temperatures, to take four observation records from points Nos. 1, 2, 3, 4, points Nos. 2 and 3 being outside the doors and the others on the fire side of doors. A continuous record was also taken from point No. 5.

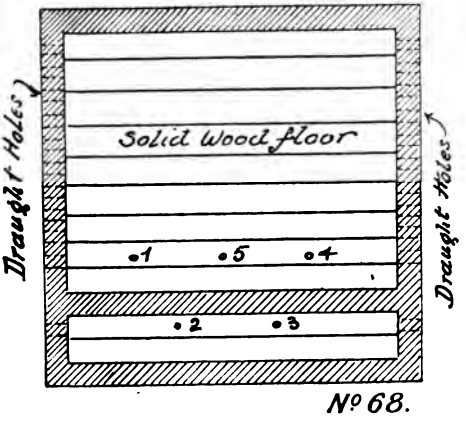
There were observation holes in the north and south walls, closed by movable iron shutters.

The draught holes were in the north and south walls.

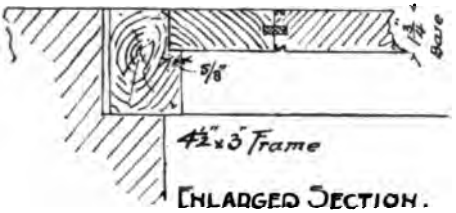


SECTION LOOKING NORTH

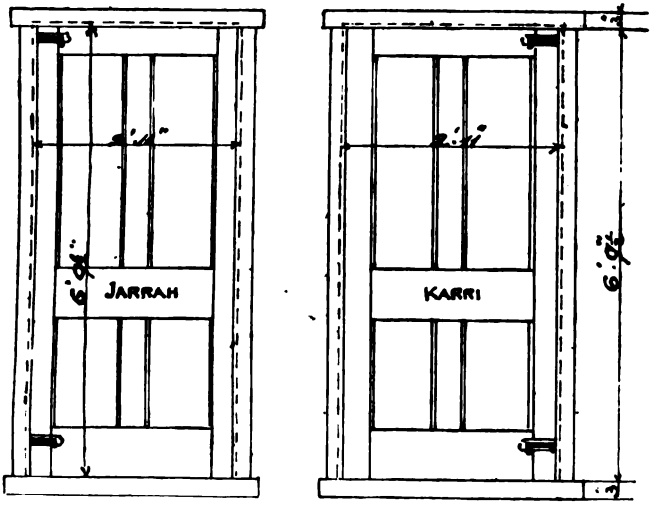
Note. The points marked 1·2·3·4·5 are Thermo Junctions attached to wires leading to Pyrometers N° 5 is self recording



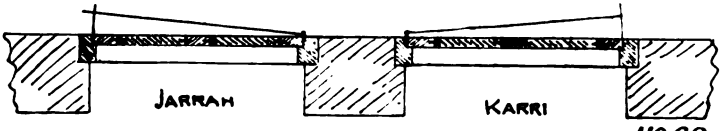
PLAN OF ROOF



ENLARGED SECTION.



ELEVATION OF DOORS



No 68.

PLAN OF DOORS

(*Fig.* E.)

The photographs were taken during the test by flash-light, there being a fog at the time.

A brick wall, 14 in. thick, with two openings 3 ft. 3 in. wide, 7 ft. high, was built across the hut, running from north to south. It was built 15 in. back from the main wall and was carried up to the ceiling, the height between floor and ceiling being 8 ft. 6 in. The two openings were arched over with brick arches in two half-brick rings. The wall was built with gauged stuff.

CONSTRUCTION OF THE DOORS.

THE JARRAH DOOR.

(*See Fig.* E).

The door was of Australian Jarrah wood, $1\frac{3}{4}$ in. (bare) when finished, four panels, bead butt both sides, the panels being solid $1\frac{3}{4}$ in. (bare), tongued to the styles and rails with 1 in. by $\frac{1}{2}$ in. tongues.

The styles and top rail were $4\frac{1}{4}$ in. wide, the centre rail was $8\frac{5}{8}$ in. wide and the bottom rail was $8\frac{7}{8}$ in. wide.

The door was hung with one pair of 4 in. wrought-iron butts, and fastened with two 6 in. iron barrel bolts fixed on the outside of the door.

The frame was said to be of the same wood as the door, $4\frac{1}{2}$ in. by 3 in. with $\frac{1}{2}$ in. rebate, and was secured to the brick reveals with deal plugs and spikes, the joints pointed with mortar.

The sill was of Jarrah, $4\frac{1}{2}$ in. by 3 in., not rebated, bedded on the brickwork.

THE KARRI WOOD DOOR.

The door was of Australian Karri wood, and was constructed and hung as the Jarrah door.

Note.—The doors and frames were fixed in the hut on November 29th, 1901. The Jarrah door was on the north side and the Karri door on the south side. The bottoms of the doors were 9 in. above the floor of the hut.

Fig. F. THE DOORS: VIEW TAKEN DURING TEST AFTER 16 MINUTES.

Fig. G. THE DOORS: VIEW TAKEN DURING TEST AFTER 30 MINUTES.

Fig. H. THE DOORS: VIEW TAKEN DURING TEST AFTER 50 MINUTES.

Fig. I. VIEW TAKEN AFTER TEST.

THE TEST.

(*See Figs.* F, G, H, I, J).

On December 4th, 1901, the test was undertaken. The following is a log of the test :—

At 3 p.m. the meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows :—

"State of weather, overcast; Wind, W.S.W.; Barometer, 30·29 in.; Attached Thermometer, 43·5° Fahr.: Dry Bulb, 41·5° Fahr.; Wet Bulb, 40° Fahr.; Remarks, dull afternoon, fog moderate, smoky.

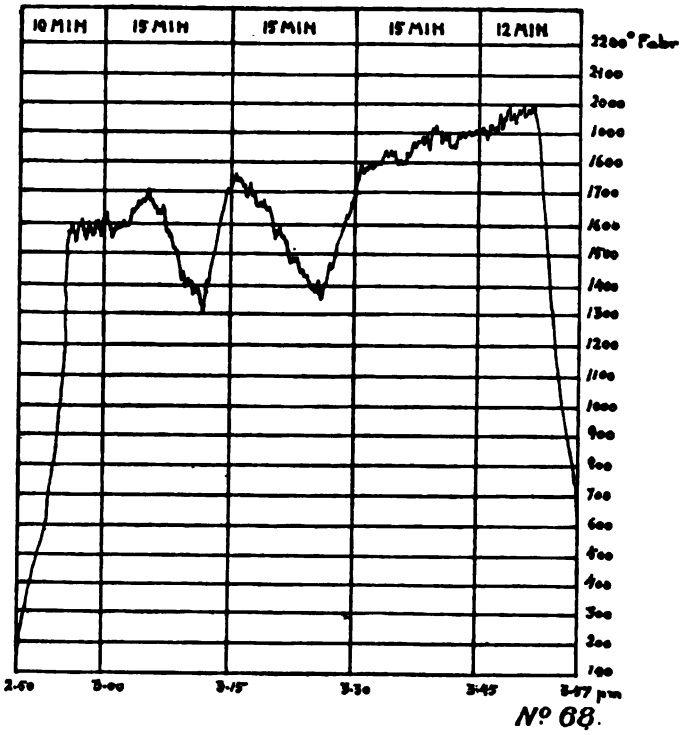
The following temperature observations were taken during the test from points Nos. 1, 2, 3 and 4 :—

OBSERVATIONS TAKEN AT POINTS 1, 2, 3, 4.

(From 2.54 p.m. to 3.51 p.m.)

Time.	Inside.		Outside.	
	No. 1.	No. 4.	No. 2.	No. 3.
p.m.	Deg. Fahr.	Deg. Fahr.	Deg. Fahr.	Deg. Fahr.
2.54	1600	1600	—	—
2.57	1800	1750	—	—
3.0	1800	1750	—	—
3.3	1750	1700	—	—
3.6	1800	1700	—	—
3.9	1550	1450	—	—
3.12	1400	1300	—	—
3.15	1700	1800	—	—
3.18	1700	1725	—	—
3.21	1620	1620	450	150
3.24	1400	1400	400	150
3.27	1500	1550	400	175
3.30	1800	1850	500	300
3.33	1850	1900	650	500
3.36	1875	1900	650	600
3.39	1975	1975	723	700
3.42	2000	2000	850	780
3.45	1950	1950	950	850
3.48	2050	2000	1300	1100
3.51	1100	1100	900	750

AUTOMATIC RECORD AT POINT NO. 5.



OBSERVATIONS ON THE OUTSIDE.

JARRAH DOOR.

At 2.50 p.m. the gas was lighted.

At 2.51 p.m. smoke coming through joint between top of door and head of frame, and also between the upper panels, muntin and styles.

KARRI DOOR.

At 2.50 p.m. the gas was lighted.

At 2.51 p.m. smoke coming through joint between top of door and head of frame, and also between the upper panels, muntin and styles.

JARRAH DOOR—*continued.*

At 3.3 p.m. glow over the top of door.

At 3.6 p.m. flash of flame over the top of door.

At 3.9 p.m. flame at each corner of door between top rail and frame.

At 3.16 p.m. flame all along between top rail of door and frame.

At 3.25 p.m. flame had decreased over top of door.

At 3.27 p.m. flame licking through joint between door and frame on right side below top hinge, and flame increasing over top of door.

At 3.30 p.m. top of door bending inwards 1 in. at left side and rather less on right side.

At 3.32 p.m. flame extending down through joint between left style of door and frame, upper panels warping inwards in centre.

At 3.37 p.m. vertical cracks extending about 9 in. down upper panels.

KARRI DOOR—*continued.*

At 3.15 p.m. flame all along between top rail of door and frame.

At 3.25 p.m. flame had decreased over top of door.

At 3.27 p.m. smoke coming through joints between top rail and top panels, and flame increasing over top of door.

At 3.32 p.m. glow at the junction of lower muntin and bottom rail, upper panels warping inwards in centre.

JARRAH DOOR—*continued.*

At 3.38 p.m. top rail alight all along, and also top of right and left styles.

At 3.45 p.m. smoke coming through joints between upper part of styles and upper panels.

At 3.47 p.m. flame extending downwards through joint between styles of door on each side and upper part of frame.

At 3.48 p.m. glow at junction of centre rail and left style.

At 3.50 p.m. test closed.

KARRI DOOR—*continued.*

At 3.38 p.m. top rail alight all along.

At 3.42 p.m. glow between left style and frame at level of centre rail.

At 3.43 p.m. glow increasing at junction of lower muntin and bottom rail, and also glow at top of lower muntin and middle rail.

At 3.47 p.m. flame extending downwards through joint between styles of door on each side and upper part of frame.

At 3.48 p.m. the door panels had warped inwards considerably and also centre rail.

At 3.50 p.m. test closed.

OBSERVATIONS ON THE INSIDE.

JARRAH DOOR.

At 3.30 p.m. top left-hand corner of door had warped inwards 1 in., right-hand top corner had warped inwards $\frac{3}{4}$ in., and centre of door was close to rebate.

KARRI DOOR.

OBSERVATIONS AFTER TEST

JARRAH DOOR.	KARRI DOOR.
At 3.51 p.m. water was applied through a ½-in. branch for 1½ minutes, and on the first application the top rail fell inwards.	At 3.51 p.m. water was applied for 1½ minutes, and after a few moments the top rail fell inwards.
At 4.25 p.m. the right top panel fell inwards.	
At 12 noon on December 5, 1901, the door was examined. It was in position (except the top rail and right top panel), held up by the lower hinge and lower bolt; at the level of the top panel the door was warped inwards 2¾ in. from the rebate of frame, the three remaining panels were curved inwards, each about ½ in.	At 12 noon on December 5, 1901, the door was examined. It was all in position (except top rail); the lower panels and lower muntin were loose, the door was warped inwards at the top, 1 in. on the left side and ½ in. on the right side.
The frame was burnt 11 in. down the left side, and 22 in. down the right side and all along the head, but the rebate was clear and distinct.	The frame was burnt 14 in. down the left side, and 8 in. down the right side and all along the head, but the arris of the rebate was still sharp, though much charred.

263005

Fig. J. VIEW TAKEN FROM INSIDE AFTER TEST.

GENERAL ARRANGEMENTS.

The test was carried out according to the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive, comprising :—

Mr. Max Clarke, A.R.I.B.A.
Mr. Ellis Marsland, District Surveyor, Camberwell.
Mr. H. B. White, M.Inst.E.E.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.Inst.E.E., superintended in the Instrument Room.

The Executive was represented by—

Mr. Edwin O. Sachs (Chairman).

The general body of Members was represented by—

Mr. T. F. Britton (L. G. Omnibus Co.)—Mr. T. Dyson, Chief Officer, Fire Brigade, Windsor—Mr. E. Dru Drury, F.R.I.B.A., F.S.I., District Surveyor, St. Margaret's, Westminster—Mr. William Grellier, F.R.I.B.A., District Surveyor, Clapham — Mr. W. Hewson Lees, A.R.I.B.A., District Surveyor, S.E. Deptford—Mr. R. P. Notley, F.R.I.B.A., F.S.I., District Surveyor, Bethnal Green—Mr. L. Pyke, F.C.S., A.M.Inst.C.E., M.I.E.E.—Mr. James Sheppard (North British and Mercantile Insurance Co.)—and Mr. W. Weaver, M.Inst.C.E., Borough Engineer and Surveyor, Kensington.

The Commercial Section was represented by—

Mr. F. R. Farrow, F.R.I.B.A. (Chairman)—Mr. R. Hope Bridie (The Electric Timber Seasoning and Preservation Co., Ltd.)—Mr. J. D. O'Brien (The Columbian Fireproofing Co.)—Mr. J. A. King (Messrs. J. A. King & Co.)—Mr. C.

H. Sankey (Messrs. Sankey & Son)—Mr. H. B. Tarry—Mr. A. Williams (Messrs. G. A. Williams & Sons).

Messrs. Millars' Karri and Jarrah Forests, Ltd., was represented by :—

Mr. Joseph Temperley — Mr. Chas. Temperley — Mr. W. D. Goslett — Mr. W. L. Green — and Mr. J. W. Richardson.

The following visitors attended by special invitation of the Executive—

Mr. C. McArthur Butler (Society of Architects) ; Mr. J. Cowper (The Columbian Fireproofing Co.) ; Mr. Howard Drury ; Major C. J. Fox (London Salvage Corps) ; Mr. G. E. Hayles (The Commercial Union Assurance Co.) ; Mr. E. A. Brayley Hodgetts ; Mr. W. Hunting (L. G. Omnibus Co.) ; Mr. L. J. Langridge ; Mr. T. Howard Mercer (L.C.C.) ; Mr. John Parker ; Mr. A. Pye-Smith (The St. Pancras Ironwork Co., Ltd.) ; Mr. F. Norman Reckitt ; Sir Joseph Renals, Bart. (ex-Lord Mayor) ; Mr. F. W. Schafer (The Shannon, Ltd.) ; Mr. G. W. Stubbings (G.E. Railway Fire Brigade) ; and Mr. O. W. White.

Signed,

For the Sub-Committee conducting the test :
MAX CLARKE.

For the Commercial Section :
FREDERIC R. FARROW.

For the Executive :
EDWIN O. SACHS.

Published by the Committee as directed by the Executive.

H. S. TAYLOR
(*Assist. Secretary*).

Date—March 12, 1902.

Verified a true copy of the Report ordered to be published.

WILLIAMSON, HILL & CO.
(*Solicitors*).

Date—April 3, 1902.

PUBLICATIONS of the BRITISH FIRE PREVENTION COMMITTEE

(*Continued from Second Page of this Publication*).

49. FIRE TESTS WITH DOORS. A 2¼-inch Door of Archangel Deal constructed in Three Thicknesses; a 2⅝-inch Door of Quebec Pine constructed in Three Thicknesses. Particulars of Experimental Fire Tests.

50. FIRE TESTS WITH DOORS. A 2¼-inch Door of Archangel Deal constructed in Three Thicknesses; a 1⅝-inch Door of Teak, Flush Panelling on each side, the Panels being in Two Thicknesses. Particulars of Experimental Fire Tests.

51. FIRE TESTS WITH FIRE RESISTING CURTAINS. Two Fire Blinds, known as the "Williams" Fire Blinds, installed by G. A. Williams & Son, Bayswater, London. The Committee's Report.

52. FIRE TESTS WITH PARTITIONS. A Partition formed with "Mack" Patent Slabs, and erected by M. J. A. King & Co., London. The Committee's Report.

53. FIRE TESTS WITH PARTITIONS. A Partition known as the "Cunnah-Wright" Partition, by the Fireproof Partition Syndicate, Ltd., London. The Committee's Report.

54. FIRE TESTS WITH DOORS. A 2¼-inch Door of Oak constructed in Three Thicknesses; a 2¼-inch Door of Teak constructed in Three Thicknesses. Particulars of Experimental Fire Tests.

55. FIRE TESTS WITH FLOORS. A Floor of Deal Joists and Coke Breeze Concrete with Expanded Metal and Plaster Ceiling. Particulars of Experimental Fire Tests.

56. FIRE TESTS WITH FLOORS. A Floor by the Mural and Decorations Syndicate, Ltd., London, being a Double Test. The Committee's Report.

57. FIRE TESTS WITH TREATED WOOD. A Match-boarded Partition of Deal painted with Oil-colour; a Match-boarded Partition of "Non-Flammable" Deal painted with "Non-Flammable" Paint by the London Non-Flammable Wood Company, Ltd., London. The Committee's Report.

58. FIRE TESTS WITH PARTITIONS. A Partition known as the "Cunnah-Wright" Partition, by the Fireproof Partition Syndicate, Ltd., London. The Committee's Report.

59. FIRE TESTS WITH DOORS. An ordinary 4-Panelled Deal Door; an ordinary Ledged Deal Door. Particulars of Experimental Fire Tests.

60. FIRE TESTS WITH DOORS. Two Iron Doors. Particulars of Experimental Fire Tests.

61. FIRE TESTS WITH FLOORS. A Floor of Steel Joists with Coke Breeze Concrete. Particulars of Experimental Fire Tests.

62. FIRE TESTS WITH CEILINGS. A Wood Floor and Ceiling protected by an Additional Suspended Ceiling by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.

63. FIRE TESTS WITH PARTITIONS. A Partition erected by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.

64. FIRE TESTS WITH FLOORS. A Floor by Banks' Fireproof Construction Syndicate, Ltd., London. The Committee's Report.

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EXPERIMENTAL FIRE TESTS

TWO 2-in. DOORS OF DEAL

Hung in one Opening with a Space between the Doors.

TWO 2-in. DOORS OF OAK

Hung in one Opening with a Space between the Doors.

PARTICULARS
OF
EXPERIMENTAL FIRE TESTS

LONDON, 1902

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(Founded 1897—Incorporated 1899)
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36. FIRE TESTS WITH TREATED WOOD. "Non-Flammable" Wood by the British Non-Flammable Wood Company, Ltd., London.
37. FIRE TESTS WITH PARTITIONS. A Partition erected by the "Gypsine" Brick Company, Ltd., London and Paris.
38. FIRE TESTS WITH FLOORS. A Floor by the "Gypsine" Brick Co., Ltd., London and Paris.
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OBJECTS OF THE COMMITTEE:

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances, are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

NOTE.

THE report herewith put forward by the Executive refers to an experimental fire test arranged with the view of showing what can be done by closing a door-opening with two doors, hung in such a way that there are a few inches of space between the doors.

Two-inch doors were used, and in one of the openings the two doors were of deal, whilst in the other they were of oak.

The results obtained call for comparison not only with the results shown by single wood doors of varying thickness and construction, but with the results obtained from tests with single iron doors and armoured doors.

EDWIN O. SACHS.

LONDON,
April 5, 1902.

THE GENERAL ARRANGEMENTS FOR TESTS.

(MEMORANDUM)

The purpose of the tests undertaken by the British Fire Prevention Committee is to obtain reliable data as to the exact fire-resistance of the various materials, systems of construction, or appliances used in building practice.

The tests are of an entirely independent character, arranged on scientific lines, but with full consideration for the practical purpose in view. Absolute reliability is assured, records being mostly taken automatically, or by photography, and the temperatures being easily regulated by the application of gas.

All reports on tests solely state the bare facts and occurrences, with tables, diagrams and illustrations, and on no account are reports to include expressions of opinion, nor should any expression be read as a comparison or criticism.

The general arrangement and direction of the tests are in the hands of the Executive, who act in accordance with certain principles laid down after careful study and experiment. The official tests are attended by the members of the Council and the members of the Committee in rotation.

As to the Committee's present Testing Station, it comprises a house, standing in its own grounds, near Royal Oak Station, and backing on to the Great Western Railway. The principal building is used for Committee Rooms and laboratory purposes, whilst the gardens are utilised for so-called "full-size" tests.

As to the financial aspect of the station, the establishment expenses are being met by a special subscription. As far as the funds of the Committee permit, investigations and experimental tests with ordinary (*i.e.* not patented) forms of construction are undertaken from time to time and duly reported on. Official tests with patented materials, makers' systems, etc., etc., are subject to a scale of charges, but these charges are so figured as to only just cover the actual cost. The Testing Station is also open to members for such private research work or tests they may desire to undertake.

The services of the members participating in the management of the station, conducting or attending tests, are given entirely gratuitously.

For the Executive,

EDWIN O. SACHS, *Chairman.*

EXPERIMENTAL FIRE TESTS

CONDUCTED BY THE EXECUTIVE

OF THE

BRITISH FIRE PREVENTION COMMITTEE.

[FOUNDED 1897—INCORPORATED 1899.]

FIRE TESTS Qa & Ra. DECEMBER 4TH, 1901.

Qa.—Two 2-in. Doors of Deal, hung in one opening with a Space between the Doors.

Ra.—Two 2-in. Doors of Oak, hung in one opening with a Space between the Doors.

OBJECT OF TEST.

To record the effect of a fire of at least one and a half hours, gradually increasing to a temperature of 2000° F.

Note.—The fire was to be applied from one side, the inner doors were to open inwards and the outer doors to open outwards.

The door openings were to be approximately 7 ft. by 3 ft.

SUMMARY OF EFFECT.

Deal Doors.

The inner door began to fall 65 minutes after the gas was lighted, and the whole fell in the ensuing 5 minutes.

Smoke began to issue through joint of outer door and frame 48 minutes after the gas was lighted.

The outer door was burnt through in 68 minutes, the flames being drawn to the inside of hut by draught.

The outer door commenced to fall 101 minutes after the gas was lighted, and all fell in the next 5 minutes.

Oak Doors.

The inner door commenced to fall 76 minutes after the gas was lighted, and the whole fell in the ensuing 9 minutes.

Flame appeared through the outer door in 100 minutes after the gas was lighted, and rapidly increased during the succeeding 5 minutes till the closing of the test.

DESCRIPTION OF TESTING PLANT.

(*See Figs.* A, B, C *and* D.)

The Testing Chamber used was located at the Committee's Testing Station, and was known as No. 4 Hut.

The Hut was constructed, as shown, of stock bricks, with lime mortar, and measured 10 ft. by 10 ft. internally. The ceiling of the hut was 9 ft. 6 in. above the pavement of the chamber, and was formed of concrete and steel joists.

The fuel used was gas produced at the station, and the supply was regulated by valves and dampers.

Thermo Junction
Observation Hole
7'-7"
N
W
E
S

The gas was admitted through two mixing chambers of fire-brick, as shown.

Two Roberts-Austen pyrometers were used for recording temperatures, to take four observation records from points Nos. 1, 2, 3, 4; points 1 and 4 being outside the door and the others on the fire side of doors. A continuous record was also taken from point No. 5.

There were observation holes in the north and south walls, closed by movable iron shutters.

The draught holes were in the north and south walls.

The photographs were taken by flashlight.

A brick wall 14 in. thick, with two openings 3 ft. 3 in. wide, 7 ft. high, was built across the hut, running from north to south. It was built 15 in. back from the main wall. The wall was carried up to the ceiling, the height between floor and ceiling being 9 ft. 6 in. The two openings were arched over with brick arches in two half-brick rings. The wall was built with gauged stuff.

CONSTRUCTION OF THE DOORS.

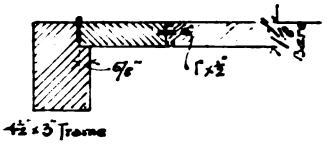
(*See Figs.* E *to* G.)

The Deal Doors.

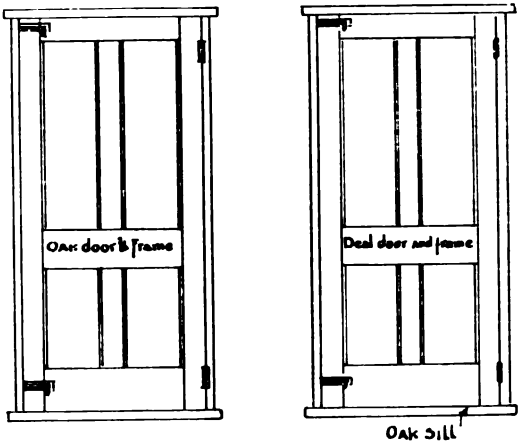
These doors were in the north opening of the hut. There were two sets of doors and frames in each opening, and they were constructed of deal and measured $1\frac{7}{8}$ in. bare when finished. They were four-panel bead butt both sides, the panels being solid in two pieces with glued joint, and the same thickness as the styles, and tongued to the rails and styles with 1 in. by $\frac{1}{2}$ in. tongues.

The styles and top rails were $4\frac{1}{2}$ in. wide; the middle and bottom rails were 9 in. wide.

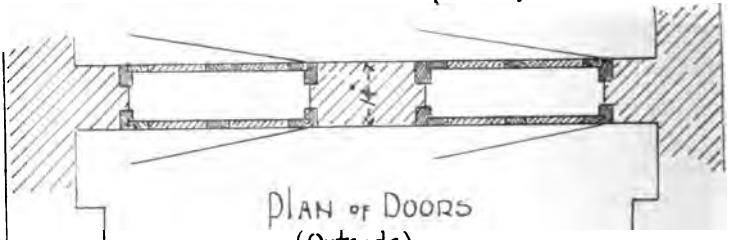
The doors were hung with a pair of 4 in. wrought iron



Enlarged Section.



Elevation of Doors (Outside)



No. 69.

Figs. E *and* F. Details of Doors.

Fig. G. VIEW TAKEN BEFORE TEST.

butts and fastened with two 6 in. iron barrel bolts fixed on the outside of outer door and on the inside of inner door.

The frame was of fir $4\frac{1}{2}$ in. by 3 in. with $\frac{5}{8}$ in. rebate, and was secured to the brick reveals with plugs. These doors had a $4\frac{1}{2}$ in. by 3 in. oak sill.

The Oak Doors.

These doors were constructed in every respect similar to the deal doors.

The doors and frames were fixed in the hut on July 16th, 1901.

All joints against brickwork were stopped up with mortar.

The doors were covered with tarpaulins and remained covered until December 4th, when the test was undertaken.

Both doors were swollen with damp and jammed tight in their rebates.

THE TEST.

(*See Figs.* H *to* L.)

On December 4th, 1901, the test was undertaken, the following being the log of the test:

The meteorological observations taken at 3 p.m. at the Botanical Gardens, Regent's Park, read as follows:—

State of weather, overcast; Wind, W.S.W.; Barometer, 30·29 inches; Attached Thermometer, 43·5° F.; Dry Bulb, 41·5° F.; Wet Bulb, 40° F.; Remarks, dull afternoon, fog moderate, smoky.

The following temperature observations were taken during the test from points Nos. 1, 2, 3 and 4.

The continuous record from point No. 5 failed.

Time.	Outside.		Inside.	
	No. 1.	No. 4.	No. 2.	No. 3.
P.M.	Deg. Fahr.	Deg. Fahr.	Deg. Fahr.	Deg. Fahr.
1.0	...	...	...	...
1.3	...	...	...	...
1.6	...	...	...	...
1.9	...	..	650	650
1.12	...	...	1000	1000
1.15	...	...	1150	1150
1.18	...	...	1100	1150
1.21	...	...	1150	1400
1.24	...	...	1150	1400
1.27	...	...	1000	1325
1.30	...	...	1350	1350
1.33	...	...	1425	1475
1.36	...	...	1400	1600
1.39	...	...	1450	1700
1.42	...	...	1450	1600
1.45	...	...	1550	1600
1.48	...	...	1550	1625
1.51	...	...	1550	1600
1.54	...	...	1650	1750
1.57	...	...	1625	1700
2.0	...	...	1650	1700
2.3	...	...	1700	1750
2.6	...	...	1700	1700
2.9	...	...	1775	1775
2.12	...	...	1900	1850
2.15	...	...	1900	1875
2.18	...	...	1950	1950
2.21	...	...	1975	2025
2.24	...	...	1950	2050
2.27	...	...	2000	2000
2.30	...	...	2050	2000
2.33	...	...	2000	1975
2.36	...	...	2000	2000
2.39	150	...	2000	2050
2.42	275	...	2000	2050
2.45	325	...	1975	2000
2.48	375	...	1925	1925
2.51	...	...	...	...
2.54	...	...	...	..

Fig. II. VIEW TAKEN AFTER 89 MINUTES.

Fig. I. VIEW TAKEN AFTER 94 MINUTES.

Fig. K. VIEW TAKEN AFTER 101 MINUTES.

The following observations were made during the test as seen from outside :—

OBSERVATIONS ON THE OUTSIDE.

Time.	OAK DOORS.	Minutes elapsed.	DEAL DOORS.
P.M.			
1.5	The gas was lighted.	...	The gas was lighted.
1.50	Smoke began to issue between joint of door and frame at top right-hand corner.	45	
1.53		48	Slight smoke began to issue between joint of door and frame at top right-hand corner.
2.5		60	Smoke increased and spread down joint of door and frame below top hinge.
2.13		68	A glow was seen through the bottom of door.
2.18		73	Smoke was coming through joint of door and frame at left top corner.
2.24		79	Flame appeared through joint between door and frame at right top corner.
2.25		80	The glow along bottom of door was increasing.

Time.	Oak Doors.	Minutes elapsed.	Deal Doors.
2.27		82	A glow was seen between joint of door and frame on right-hand side below bottom hinge.
2.35		90	The panels and rails were slightly buckling.
2.37		92	A glow was seen through lower edge of bottom panels.
2·41	Two panels were warping inwards.	96	The lower panels were alight along edges and the top of upper panels was alight.
2.45	Flame appeared between top rail and right upper panel and over top of hanging style.	100	
2.46		101	The lower left-hand panel fell out.
2.49	Flame appeared between lock rail and hanging style.	104	
2.50	Flame appeared over top of slamming style. Test closed.	105	Test closed.

The following observations were made during the test as seen through the observation holes of the testing chamber:

OBSERVATIONS ON THE INSIDE.

Time.	OAK DOORS.	Minutes elapsed.	DEAL DOORS.
P.M.			
1.5	The gas was lighted.	...	The gas was lighted.
1 7		2	The inner door was alight.
1.10	The inner door was alight.	5	The door was well alight.
1.11	The door was well alight.	6	
1.20	The door was charred all over.	15	The door was charred all over.
1.30	The door was burning steadily.	25	The door was burning briskly and the lock rail had cracked longitudinally.
1.35	The door was burning briskly.	30	
1.45	The upper panels and muntin were bulging outwards, especially the muntin.	40	The lock rail had split by expansion of above-mentioned longitudinal crack.
1.55	The door was burning briskly; the upper panels and muntin were badly bulged.	50	The door was burning briskly; the lower muntin and panels were bulging outwards.

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Time.	Oak Doors.	Minutes elapsed.	Deal Doors.
2.0	The door commenced to flake. The upper panels and muntin were very badly bulged; the lower panels were commencing to bulge.	55	Smoke from the outer door was issuing through cracks in the inner door, and the lower panels and muntin were badly bulged.
2.9		64	The door was burning furiously.
2.10		65	The lower panel on south side of inner door fell.
2.12		67	The upper panel on the north side of door fell.
2.13		68	The upper panel on south of door fell.
2.14	The bulging of the door had increased.	69	Half of lock rail on south side of door fell.
2.15		70	The remainder of inner door fell. The outer door became exposed to view and was seen to be charred all over.
2.21	The upper panels and muntin of the door commenced to fall.	76	
2.25	The remainder of upper panels and lock rail fell.	80	

Time.	Oak Doors.	Minutes elapsed.	Deal Doors.
2.26	The lower panels with the muntin fell; the styles remained standing. The outer door appeared to view and was seen to be charred all over.	81	
2.30	The remainder of inner door fell. The outer door was well alight.	85	The outer door was well alight.
2.40	The door was burning briskly. The door was slightly bulged.	95	The outer door was burning briskly. The flames from the outer door were being drawn towards the interior of the hut by the draught. The door was bulging slightly.
2.46		101	The lower panel on south side and muntin fell outwards.
2.48		103	The top rail of the door fell outwards.
2.50	The door was burning briskly. Test closed.	105	The outer door was on the point of falling. Test closed.
	Observation on Conclusion of the Tests.		
2.51		106	The door collapsed, falling outwards.

OBSERVATIONS AFTER THE TEST.

(*See Fig.* L.)

The following observations were made on December 5th, the day after the test :—

Oak Doors.	*Deal Doors.*
One side of the inner door frame was in position, but much charred.	The inner frame and door were all consumed.
The outer frame and the right style of door and hinges were in position.	The outer frame was in position, but seriously damaged. The hinges were still attached to frame.
The rest of the outer door had fallen outwards and was in pieces.	
The outer face of panels, styles and rails was clean and not charred, except the top portion of upper panels. The top rail was all consumed.	The outer door was all destroyed,only the charred remains being left.

GENERAL ARRANGEMENTS.

The test was carried out in accordance with the procedure laid down by the Executive for investigations of this description, and conducted by a Sub-Committee of the Executive, comprising—

Mr. F. R. Farrow, F.R.I.B.A.
Mr. Ellis Marsland, District Surveyor, Camberwell.
Mr. H. B. White, M.Inst.C.E.

Mr. Thomas Kissack, Resident Engineer at the Testing Station, assisted the Sub-Committee.

Mr. H. B. White, M.Inst.C.E., superintended in the Instrument Room.

The Executive was represented by—

Mr. Edwin O. Sachs (Chairman).
Mr. Max Clarke, A.R.I.B.A.

The general body of Members was represented by—

Mr. T. F. Britton (L. G. Omnibus Co.)—Mr. T. Dyson, Chief Officer, Fire Brigade, Windsor—Mr. E. Dru Drury,

Fig. L. VIEW TAKEN AFTER CONCLUSION OF TEST.

F.R.I.B.A., F.S.I., District Surveyor, St. Margaret's, Westminster—Mr. William Grellier, F.R.I.B.A., District Surveyor, Clapham—Mr. W. Hewson Lees, A.R.I.B.A., District

Surveyor, S.E. Deptford—Mr. R. P. Notley, F.R.I.B.A., F.S.I., District Surveyor, Bethnal Green—Mr. L. Pyke, F.C.S., A.M.Inst.C.E., M.I.E.E. — Mr. James Sheppard (North British and Mercantile Insurance Co.)—and Mr. W. Weaver, M.Inst.C.E., Borough Engineer, Kensington.

The Commercial Section was represented by—

Mr. J. D. O'Brien (The Columbian Fireproofing Co.)—Mr. J. A. King (Messrs. J. A. King & Co.)—Mr. C. H. Sankey (Messrs. Sankey & Son)—Mr. H. B. Tarry—Mr. A. Williams (Messrs. G. A. Williams & Sons).

The following visitors attended by special invitation of the Executive:

Mr. R. Hope Bridie; Mr. C. McArthur Butler (Society of Architects); Mr. J. Cowper (Columbian Fireproofing Co.); Mr. Howard Drury; Major C. J. Fox (London Salvage Corps); Mr. G. E. Hales (The Commercial Union Assurance Co.); Mr. E. A. Brayley Hodgetts; Mr. W. Hunting (L. G. Omnibus Co.); Mr. L. J. Langridge; Mr. T. Howard Mercer (L.C.C.); Mr. John Parker; Mr. A. Pye-Smith (The St. Pancras Ironwork Co., Ltd.); Mr. F. Norman Reckitt; Alderman Sir Joseph Renals, Bart.; Mr. F. W. Schafer (The Shannon, Ltd.); Mr. G. W. Stubbings (G. E. Railway); and Mr. O. W. White.

Signed,

For the Sub-Committee conducting the Test:
FREDERIC R. FARROW.

For the Executive:
EDWIN O. SACHS (*Chairman*).

Published by the Committee as directed by the Executive.

H. S. TAYLOR
Date—April 5, 1902. (*Assist. Secretary*).

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